THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Sustained activity is still the condition in every department of the iron trade. That the high level of prices has been reached, and that the succeeding months of the year will bring increasing supplies of material, is the belief of many in the trade; but nothing has appeared as yet indicating any relief in the near future from the stress everywhere felt. Foundries are still seeking iron over and above that coming to them on their contracts, and the pressure for pig iron from rolling mills and steel works is even more urgent. The statistical position of the blast furnaces is remarkable—an output at the highest rate in their history (352,064 tons a week May 1, as against 298,460 tons a week Jan. 1), representing a production of 1,500,000 tons for the month of April, accompanied by a virtual wiping out of stocks. The 60,000 tons of coke iron on hand at merchant furnaces represents scarcely more than a day's consumption and is the smallest amount thus carried in many years. The story of iron and steel consumption told by these figures is marvelous, and yet at the moment the possibility of interrupting this splendid record by disastrous labor disturbances is so apparent that it cannot be ignored. That the decision of the anthracite miners to continue their strike was not by a decisive vote is held to augur an early settlement, but as it stands the strike is not a favorable influence upon the iron trade. As a partial offset to its effects has come the puddlers' strike in Central Pennsylvania, with its daily curtailment of pig iron consumption. Should the soft coal miners become involved in the anthracite struggle the whole industrial situation would be seriously clouded. As to the later months of the year crop prospects will have an important bearing on the iron trade. Alternating favorable and unfavorable reports leave the impression thus far that an average yield is to be looked for. Within the iron trade, commitments for 1903 are increasing, both in pig iron and finished materials. Buying of structural material for 1903 continues, among other contracts Chicago reporting one for 5,000 tons for delivery after Jan. 1. It appears that considerable structural business for 1902 will fail of delivery this year, and this overflow, with orders already booked for the new year, represents three months' rolling. Rail mills have been able to take on additional tonnage, Pittsburg reporting a sale of 30,000 tons to the Cotton Belt Railroad for November and December delivery. Further inquiry is reported from railroads for delivery in 1903. No formal action on the price for next year has been taken, but it is expected to remain the same. Western roads, unable to get rails as wanted, have taken such "seconds" as could be had, paying $27. The plate mills in the East continue to get from $4 to $6 a ton above the agreed price, but, while all mills are well supplied with work, it is not believed the meeting of manufacturers, postponed to next month, will make any change. Domestic steel has sold at still higher prices in the week, $35 Pittsburg being paid in same cases. Imported steel has sold on a basis of $30 to $31 at Atlantic port. The pig iron situation is firmer. Southern foundry iron sells at $16 to $17 at Birmingham for No. 2, the latter price being more common. The one large interest that resumed selling last week has only a limited amount of iron to offer for this year, and the estimate that 200,000 tons of iron, yet unsold, will be produced in the South in 1902 is considered in some quarters to be a very liberal one.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, May 21.

There has been considerable inquiry and some buying of No. 2 foundry iron for delivery through the first and second quarters of next year, and in every case in which the iron has been sold there remains no doubt of the consumer's intention to take out the quantity contracted for, regardless of market conditions prevailing at that time. This future buying, so far as can be ascertained, is entirely free from speculation and is an indication that some of the largest foundry interests in the country have absolute faith in a continuance of present conditions through the first half of next year. In nearly every case the price paid was $20, Pittsburg, which seems to be the lowest that any of the furnaces accepting business so far in the future will quote. Foundry iron for spot shipment commands fancy prices and sales have been made at $21.50 to $22, Pittsburg. For delivery through the second half of the year $21.50 has been paid and in a few instances $22. There is little doing in Bessemer iron, for the reason that little is to be had, and the few 'odd lots' in the hands of dealers are being held for still higher prices.

The local steel market also continues to rule high and small lots of Bessemer billets for prompt shipments have sold at $35 in the week. In the face of these high prices the importation of German steel continues and we note the sale of 1,000 tons of sheet bars at $33, Pittsburg. Domestic rods are also exceedingly scarce and are commanding still higher prices. Unless the domestic market advances still further there can be no importation from abroad, as the rods cannot be laid down in Pittsburg for less than $40 per ton. The German market continues practically unchanged, and it is doubtful if the German steel manufacturers will make any further advances in the price of their product inasmuch as only a slight increase would result in an addition of $2.24 per gross ton to the duty, and this would practically prohibit further importation. All of the large steel concerns continue short of their regular supply. Jones & Laughlins, Ltd., will soon place in operation two acid open-hearth furnaces and a Talbot furnace which will add to the daily output of the plant about 500 tons. For some time this concern has been short of steel, but this will supply all their finishing mills and will enable them to place a fair tonnage on the market.

Despite the scarcity and apparent shortage of steel rails the Carnegie Steel Co. closed a contract for 30,000 tons of rails with the Cotton Belt railroad deliveries to commence late in the fall. The starting of the rail mill at Youngstown has relieved the situation. In structural shapes the shortage grows more pronounced daily, and from present indications a heavy tonnage that was to have been delivered before the end of the year will be carried over into next year. The Carnegie Steel Co. continues to close contracts for structural material for delivery in 1903 and these orders together with the heavy tonnage that will be carried over already amounts to nearly three months' production.

PIG IRON.—Unless the demands for a shorter work day are granted the blast furnace workers in the Youngstown, O., district, there is every indication of a strike June 1. With pig

iron stocks constantly growing smaller, and despite the immense production of the past month, prices of all grades of iron continue to advance. We note the sale of 6,000 continue to constantly advance. We note the sale of 6,000 tons of No. 2 foundry for delivery the second half of the year at $21.50, while small lots for delivery to July 1 are selling as high as $22. There is a wide range of prices on forge iron and we note the sale of 1,000 tons for July, August and September delivery at $20.50, Pittsburg. There is little Bessemer iron moving and small lots for prompt shipment have sold during the week at $21.25, Valley furnace. There has also been considerable buying of foundry iron for delivery through the first and second quarters of next year at $20, Pittsburg, for No. 2. Nor has the buying been speculative, some of the most conservative concerns covering their requirements for this extended period. We revise quotations as follows:

Bessemer, Valley	$21 00 to 21 25
Bessemer, Pittsburg	21 75 to 22 00
No. 1 Foundry	21 25 to 22 25
No. 2 Foundry	21 00 to 22 00
No. 3 Foundry	19 50 to 20 50
Gray Forge, Pittsburg	19 50 to 20 75
Chilled Basic, Valley	20 50 to 21 00
Chilled Basic, Pittsburg	21 25 to 21 75

STEEL.—Bessemer billets in small lots for prompt shipment have still further advanced during the past few days, and sales have been made at $35 at mill, Pittsburg and Wheeling. Large lots of Bessemer billets cannot be secured for shipment before July 1 and for the second half of the year the offerings are very limited. One large Southern producer is offering sheet bars for second half delivery at $33.25, Pittsburg, but only a limited quantity. Foreign steel continues to be purchased in this district and we note the sale of 1,000 tons of sheet bars at $33 per ton. German billets are quoted at $32.50, Pittsburg.

FERRO-MANGANESE.—There is little domestic manganese to be had in this market, and considerable German and French manganese is being sold at $48 to $50 per ton. Domestic ferro, 80 percent, is quoted at $52.50 per ton, delivered at buyer's mill.

SPELTER.—The spelter market is somewhat firmer and prime western grades are held at 4.30c to 4.32½c, Pittsburg.

MUCK BAR.—One of the largest producers of muck iron is out of the market entirely and will remain out for some time. With the regular supply thus cut down prices continue to advance and small sales have been made during the week for prompt shipment at $35.50 per ton. For future delivery $34.50 to $35 is quoted.

SKELP.—Iron skelp continues high in sympathy with muck bar, although very little is moving at present. On both grooved and sheared iron skelp 2.25c is the minimum while steel skelp is held at 2.15c to 2.20c.

RAILS AND TRACK MATERIAL.—The Carnegie Steel Co. has received an order for 30,000 tons of rails from the Cotton Belt Railroad for November and December delivery. This is the largest order that has been taken for some time for this year's delivery, and the rails will no doubt be rolled at the Ohio plant of the National Steel Co. Light rails continue in strong demand and command high prices for prompt shipment. We make the following quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 20 pounds, $37; 25 to 40 pounds, $34 to $36. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—The meeting of the plate manufacturers has been postponed until June owing to the inability of several of its members to be present at the meeting appointed for last week. The plate situation grows stronger every day, and the Eastern mills are securing on early shipments $4 a ton above the agreed quotations. There is no indication, however, that the agreement basis will be changed at the June meeting of the manufacturers. We make the following quotations: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5c extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—The steel bar situation remains practically unchanged. While considerable new business is being closed it is confined almost entirely to small lots. Quotations are as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.70c to 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2c and upwards.

PIPES AND TUBES.—Foreign shipments of pipe were heavy during the month of April, amounting to more than 3,000 tons. The domestic demand for all kinds of merchant pipe continues very heavy and both the combine and independent mills continue to operate at their fullest capacity. We make the following discounts to jobbers in carload lots, Pittsburg:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent
⅛ to ⅜ and 11 to 12 inches	60	48
¼ to 12 inches	67	55

Discounts below are to consumers, carload lots, Pittsburg:

BOILER TUBES.

Steel.

	Per cent.
1 to 1½ inches	45
2¼ to 5 inches	63½
1¾ to 2¼ and 6 to 13 inches	58

Iron.

	Per cent.
1 to 1½ and 2½ inches	39
1¾ to 2¼ inches	38
2¾ to 13 inches	48

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12½ inches	65

SHEETS.—The demand for the heavier gauges of sheets continues large and premiums of fully $5 a ton are being secured by some of the independent mills above the quotations of the American Sheet Steel Co. for prompt deliveries. We make the following quotations: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21, 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots to consumers are as follows: Nos. 10 and 11, 3.05c; Nos. 12 to 14, 3.15c; Nos. 15 to 17, 3.25c; Nos. 18 to 21, 3.45c; Nos. 22 to 24, 3.75c; Nos. 25 and 26, 4c; No. 27, 4.25c; No. 28, 4.50c.

STRUCTURAL MATERIAL.—From present indications the local structural mills will carry a large tonnage into next year on which they expected to make deliveries before 1903 when the contracts were closed. In addition the Carnegie Steel Co. continues to close business for delivery in 1903 and the outlook for next year is very bright. Quotations are unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c. Dealers' prices, however, are from $5 to $10 above these quotations for delivery this year.

WIRE AND WIRE NAILS.—The foreign shipments of wire and wire nails from mills in the State of Pennsylvania during the month of April amounted to nearly 8,000 tons, which was 65 percent larger than shipments during the month of March. The domestic demand for wire and wire products continues good and prices are being well maintained. We quote as follows: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire $2.40 in carload lots, polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Manufacturers of high grades of steel report demand unprecedented and the tonnage that is being

constantly closed will make this year's production of crucible steel the heaviest in the history of the trade. Quotations remain unchanged as follows: Turned, cold rolled ground shafting in carload lots is quoted 50 off, and in less than carload lots, 45 off; tire steel, 1.80c in carload lots and 2c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoe, 2.10c to 2.25c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

Old Material.—While a greater volume of material is being offered there seems to be no general weakening in prevailing quotations. The large steel manufacturers, however, are not figuring as large buyers at present. We revise quotations, all gross tons, as follows: Heavy wrought scrap, $20 to $20.50; cast scrap, $17.50 to $18; iron rails, $23 to $24; car wheels, $19; cast borings, $11.50 to $12; wrought turnings, $13.50 to $14; steel rails, short lengths, $22 to $23; steel rails for rerolling purposes, $25 to $26.

Coke.—The Connellsville *Courier* estimates the production of the Connellsville region for the week ending Saturday, May 10, at 221,740 tons, a slight gain over the production of the previous week. In the lower Connellsville region the production amounted to 33,675 tons, which was about the same as the tonnage of the previous week. Furnace coke for prompt shipment continues scarce and in many instances as high as $2.75 per ton is paid for odd lots for prompt delivery. Foundry coke for prompt shipment is quoted at $3 per ton, while on contracts $2.75 is quoted. Outside cokes are held at about 25 cents per ton below these quotations.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 Monadnock Block, May 20.

Buying of pig iron for delivery in the last half, and of finished material for shipment next year, or sooner if the mills can accomplish it, grows heavier each week. There is a more moderate tone to the market in all its branches, and both manufacturers and consumers seem to think that the danger of a runaway market has passed. This is evidenced by the fact that few furnaces have opened their books for the delivery of iron in the last six months of this year, which number is growing each week, and that finishing mills are now more willing to accept orders for next year's delivery than they have been at any time for the past two months. Foreign billets and structural shapes are offered quite freely in this market, and 500 tons of open-hearth billets and 1,000 tons of structural steel have been sold in the last few days, the former at $35 a ton and the latter at $2.35 per 100 pounds. It is reported that another order for 1,000 tons of structural steel had been placed in Belgium but this could not be verified. Orders for about 5,000 tons of structural material for next year's delivery have been placed through local offices of Eastern mills in the last week, and several good sized inquiries are pending. Many railroads are sounding the market preparatory to placing orders for rails for next year's shipment, and those in urgent need are buying heavily of "seconds" from the local mill, which are being offered at $27 a ton. Some large contracts for standard sections, it is stated, have been placed with Eastern mills for delivery in the last quarter of this year. All manufacturers report that specifications are heavy, and in many cases, in advance of contracts.

Bars.—There is a plentiful amount of business being offered in small lots, with occasional orders for 1,000 tons. Specifications from all sources are very heavy. Jobbers report an active demand. We quote Chicago delivery, soft Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c; iron, 1.85c to 1.95c; hoops, 2.15c. Prices out of store, steel, 2c to 2.10c; iron, 2.25c; hoops, 2.40c to 2.45c; angles, 2.50c to 2.60c.

Pig Iron.—Though the basis of No. 2 Foundry has been fixed at $16 Birmingham by a number of Southern furnaces, more iron has been sold in the last week at $17 than at the former figure, and in one instance $18 was asked on an order for 500 tons. Buying has not been quite as heavy for delivery in the last half as was expected would be the case from the insistent demand for spot iron that has been so much in evidence for the last three months, and consumers are acting very conservatively in the matter of placing contracts for late delivery. We have advanced our prices on all grades of local coke foundry $1 a ton, and the same amount on malleable Bessemer. We quote as follows:

Lake Sup. Charcoal	$22 50 to $23 00	Southern Coke No. 4	$18 65 to $19 15
Local Coke Fdy. No. 1	22 00 to 22 50	Southern No 1 Soft	20 65 to 21 65
Local Coke Fdy. No 2	21 02 to 21 50	Southern No. 2 Soft	19 65 to 20 65
Local Coke Fdy. No. 3	20 00 to 20 50	Southern Gray Forge	16 90 to 17 90
Local ScotchFdy. No. 1	21 00 to 21 50	Southern Silveries	18 25 to 19 65
Local ScotchFdy. No. 2	20 50 to 21 00	Jackson Co. Silveries	23 10 to 23 60
Southern Coke No. 1	20 65 to 21 65	Ohio StrongSofteners	23 10 to 23 60
Southern Coke No. 2	19 65 to 20 65	Alabama Car Wheel	23 65 to 24 15
Southern Coke No. 3	19 15 to 20 15	Malleable Bessemer	21 50 to 22 00

Sheets.—The Inland Steel Co., of this city, whose mill will be in operation next month, reports it has taken a considerable tonnage in sheet bars and sheets for forward delivery. This mill will roll sheets from ⅜-inch to No. 30 gauge, and will have a capacity of over 100 tons a day. Other manufacturers report that the demand is qute active, and that mills, aided by railroads, are making good shipments. We quote No. 27 black, mill shipments, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.50c; out of store, No. 27 black, 3.45c to 3.55c; galvanized, 4.70c to 4.80c.

Structural Steel.—From the small tonnage that has been placed through the local offices of Eastern mills, consumers do not appear very anxious to contract very heavily for material for delivery next year. The tonnage booked each week does not exceed 4,000 to 5,000 tons, though the inquiry for shipment this year largely exceeds this tonnage. We note the sale of 1,000 tons of German structural steel in this market in the last week, the price paid being $2.35 per 100 pounds. It is reported that another order for a like amount was placed abroad, though we could not verify the report. We quote as follows, mill prices: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c. Prices on lots from store are based on the necessities of buyers and according to the size of order. Mills are sold up for the entire year, and consumers in immediate need of material must go to jobbers for the same or buy abroad. Store prices vary from 2½ to 4 cents a pound.

Billets.—There is a good demand for billets, and a local concern, whose mill will be in operation shortly, has booked a large tonnage. A sale of 500 tons of German billets was made in this city in the week at $35. We quote domestic billets, Bessemer, $38; open-hearth, $40.

Rails and Track Supplies.—There is an insistent demand for standard sections for prompt shipment, and failing to get these, many roads are buying "seconds," paying $27 a ton for the same. Some orders for delivery in the last quarter of this year, it is stated, have been placed with Eastern mills, though the local concern is sold up for the entire year. A number of railroads are sounding the market on the price and delivery questions, preparatory to placing orders for next year's needs. Light rails are in active demand, as well as track supplies, though on the latter material, mills are sold up for the balance of this year. We quote standard sections, $28; light rails, 45 pounds, $33; 12 pounds, $40 with regular differentials for intermediate sizes; out of store, $45 to $50; splice bars, 2c; spikes, carload lots, 2.35c to 2.50c; track bolts and hexagon nuts, 3.10c to 3.25c; out of store, 3.50c; square nuts, 2.95c base; out of store, 3.10c.

Merchant Steel.—Spring steel for sale to manufacturers of carriage springs has been advanced ¼ cent a pound. Mill agents fear that customers who do not place contracts now for next season's supply may be shut out, as indications point to a demand that will exceed the supply. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.65c to 2.75c; sleigh shoe, 1.75c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 50 percent off, Chicago; less than carload lots, 45 percent off, Chicago.

Cast Iron Pipe.—Orders for pipe continue to come in quite freely, and the local interest reports that the aggregate tonnage is large. We quote 4-inch water pipe, $31, carload lots, f. o. b. Chicago; 6-inch water pipe and larger sizes, $29 to $30; gas pipe $1 a ton higher than these prices.

Merchant Pipe.—It is rumored that some of the inde-

pendent pipe mills are not running to their full capacity on account of inability to secure skelp. There is a fair demand, which keeps up to past proportions. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
½ to ⅜ in.	56½	44½
¼ to 12 in.	63½	51½

BOILER TUBES.

Steel.

	Per cent.
1 to 1¼ in.	35
1¼ to 2½ in.	50
2¾ to 5 in.	57½
6 to 13 in.	50½

Iron.

	Per cent
1¼ in.	35
1¼ to 2¼ in.	32½
2½ in.	35
2¼ to 5 in.	42½

PLATES.—For several weeks the local plate mill has been out of the market, announcing that it would take no more orders until after July 1. For this reason, we discontinued quoting mill prices and substituted those of jobbers, who, since the announcement was made, have advanced prices $4 a ton. As some confusion has arisen from this change, we resume mill quotations, which have not yet been changed, and give jobbers' prices on mill orders, as well as on lots from store: Mill prices, Chicago delivery, are as follows: Tank steel, base, ¼-inch, 1.75c; flange steel, 1.85c. Jobbers' prices on mill orders: Tank steel, base ¼-inch, 1.90c to 1.95c; flange steel, 2c to 2.10c; out of store, tank steel, ¼-inch, 2c; 3-16, 2.10c; No. 8, 2.15c; flange steel, 2.20c.

WIRE AND WIRE NAILS.—Orders for all kinds of wire products are plentiful and aggregate a good tonnage, and the entire product of the mills of the local interest goes into immediate consumption. We quote as follows: Smooth wire, carloads, $2.15; painted barb wire, $2.75; galvanized barb wire in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents higher for less than carload lots.

COKE.—Shipments from both Connellsville and West Virginia coke regions are quite free and ample for all the needs of this district. We quote standard 72-hour Connellsville foundry, $5.25; for spot shipment, $5.50; Virginia and West Virginia coke, $5 to $5.25.

OLD MATERIAL.—Though there is very little buying at present on the part of mills, prices of all kinds of scrap are maintained very firmly by dealers. We quote gross tons, as follows:

Old iron rails	$24 00 to $25 00	Old steel rails, mixed	$16 00 to $16 50
Old steel rails, 5 ft. and up	22 00 to 23 00	Relaying rails	27 00 to 28 00
Old steel rails, 3 ft. and under	17 00 to 18 00	Old wheels	19 00 to 19 50
		Heavy melting steel	15 50 to 16 00
		Mixed country steel	13 00 to 14 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	18 00 to 18 50	Cast borings	9 00 to 9 50
Dealers' forge	15 50 to 16 00	Wrought turnings	13 00 to 13 50
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No 1 R.R. & mch.cast	14 25 to 14 75	Steel axle turnings	13 50 to 14 00
Railway Malleable	15 00 to 15 50	Stove plates	10 50 to 11 00
Country malleable	13 00 to 14 00	Old iron splice bars	21 00 to 21 50
I.o a .cs	24 50 to 25 00		

Pickands, Brown & Co., Chicago, have purchased the West Duluth furnace at Duluth, Minn., and will blow it in within the next thirty days. This furnace has been idle since 1900. When the repairs which are being made are completed, it will have a capacity of 250 tons a day.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, May 21.

The buying of iron ore in lots ranging from 5,000 to 20,000 tons which was quite steady in April and the early portion of May has fallen off materially in the past fortnight and the market is now rather quiet. There is still a good tonnage for sale, both of old range and Mesabi ores. Shippers of ore appear recently to have returned to their policy of last season, in chartering about all the boats offered at the head of the lakes. The facilities there for loading ore are very much in excess of those at the lower lakes for unloading and the result is that the vessels are coming down the lakes much faster than they can be unloaded, causing numerous and long drawn out delays. The loss to the vessel owners, therefore, comes in the form of delays to their boats rather than a reduction of the carrying charges, as the shippers do not seem inclined to interfere with present rates.

PIG IRON.—The market continues strong at the old prices. Inquiries are coming in almost daily for iron, some large and some small lots, but deliveries asked are often such that producers have no iron to offer. Some of the Southern furnaces which have been on this market for a while are withdrawing their offers of material until well along in the fall, while all of the Valley furnaces and most of those in Southern Ohio are entirely out of material for this year. The quotations made of late for early delivery have ranged between $21 and $22 for No. 2 foundry delivered in Cleveland and $16.50 to $17 for Southern foundry No. 2 at Birmingham, with a freight of $3.70 to Cleveland. A few dealers in basic are offering a little iron for sale at $20 Pittsburg. In Bessemer no sales are reported, there being an entire absence of marketable iron. We quote:

Bessemer	$20 50 to $21 50	Scotch No. 1	$21 75 to $22 75
No. 1 Strong F'dry	21 75 to 22 75	Scotch No. 2	21 00 to 22 00
No. 2 Strong F'dry	21 00 to 22 00	Gray forge, Valley	18 50 to 19 00
No. 3 Foundry	19 75 to 20 25	LakeSuperior charc'l	22 00 to 23 00

FINISHED MATERIAL.—The buying of structural steel for delivery in 1903 continues to be heavy and this week a Cleveland concern took 2,000 tons for next year. The mills are now notifying consumers that if they want deliveries during the first quarter their contracts must be in early. The mills are more exacting on sales made now and are refusing to sell to any except those who will make use of the material, speculative buyers being barred. Sales now made are on the basis quoted throughout the spring, namely 1.70c Cleveland. The demand for plates continues and the scarcity of material is more pronounced. Some of the Eastern buyers have come into this market for material and have been quoted 1.70c Pittsburg or an advance of $2 a ton over the association price. The new quotation is quite generally made, albeit the advance has not received the sanction of the association, being the individual action of the mills which have material yet for sale. The jobbers who had contracts on lighter plates report now that their material is entirely sold up for some time ahead. Consumers are depending entirely on the supply from the mills which seems to have been limited because of the heavy draft on the steel supply for other finished forms. The demand for bars keeps up but the supply for early delivery is very short. The higher price for bar iron has eased up the buying of that material and the consumers seem to be going in more heavily for steel bars. The larger mills are paying more attention to the production of steel bars and the bar iron tonnage has let down materially. The heavy buying during the last few weeks has about used up the available supply for the time being, and no deliveries are offered on new mill contracts now inside of seven or eight months. Prices have not changed from 1.60c Pittsburg for Bessemer steel bars; 1.70c Pittsburg for open-hearth steel bars; 1.80c Pittsburg for bar iron. The sheet trade is moving along on an even keel with no great rush for material and with the demand but a little ahead of the supply. The product of independent mills continues more strongly competitive in galvanized than in black sheets. The shortage of sheet bars may cause a certain reduction in sheet production but it is not expected to be serious enough to affect prices as the steel corporation mills are expected to maintain prices on substantially the present plane. The market is still represented by 2.50c for No. 10 as a basis on the gauges between Nos. 10 and 16 and by 3.50c to 3.60c for No. 27 as a basis for the lighter gauges.

OLD MATERIAL.—There is some evidence that a speculative contingent holds a considerable stock of scrap bought some time ago in anticipation of heavy purchases by the mills. Large consumers of mill scrap are not buying at present prices, however, and the market has been quiet in the past week. Foundry scrap is only moderately active and stocks are firmly held. We continue quotations as follows, all for gross tons:

Old iron rails	$ 24 00 to 26 00
Old steel rails (6 ft. and over)	21 00 to 23 00
Old steel rails (6 ft. and under)	17 00 to 19 00
Old car wheels	18 00 to 19 00
No. 1 R. R. wrought scrap	21 00 to 22 00
Mill scrap	17 00 to 18 50
No. 1 machine cast scrap	15 00 to 16 00
Iron axles	26 00 to 28 00
Axle turnings	16 00 to 17 00
Wrought turnings (free from cast)	13 50 to 14 00

Cast borings	9 00 to 10 00
Uncut wrought iron boilers	11 00 to 12 00
Steel boiler plates	16 00 to 17 00
Grate bars	11 00 to 12 00
Pipes and flues (clean)	17 00 to 18 00
Tank iron	17 00 to 18 00
Hoop and band iron	13 00 to 14 00
Sheet iron	11 00 to 12 00
Wrought drillings	13 00 to 13 50
Malleable iron	17 00 to 18 00
Stove plate	12 50 to 13 50
Heavy steel	17 50 to 18 50

CINCINNATI.

May 21.

There seems to have been a renewal of strength all along the line, following the announcement by some of the large Southern pig iron producers that they were ready to sell iron again after remaining out of the market for two months. The real factor of influence through the entire market, in the action of these furnaces was, of course, the fact that they began selling iron at $16 instead of $12 at which price they were selling when the agreement was made to keep out of the market until May 1. The entire situation is firm and the demand shows no sign of being curtailed in any direction. There has been more of a movement in pig iron during the past week, and some buying has been reported for delivery into 1903. It is also more nearly correct to report iron at $16 to $17 for No. 2 at Birmingham than $16 flat, a number of sales having been reported at the higher figure.

The demand for finished material is reported even greater by handlers, and it is impossible to get any satisfactory deliveries on structural material at all. Several inter-urban traction lines that have been building into Cincinnati for some months have received during the past week or ten days 200 cars of rails that were contracted for in June, 1901. Machine tool builders and all consumers of iron among manufacturers report a steady and increasing business.

Pig Iron.—Southern producers marked up the price of iron again this week, the smaller furnaces being the leaders in the matter. It is understood that the large Southern producers have not advanced their price but are still selling at $.6 Birmingham. Numerous sales have been made by others at $17. Some contracts have been taken for delivery during 1903, but the iron sold was less of the foundry grades than of car wheel iron and special grades. A large transaction in Southern car wheel iron—something over 3,000 tons—was made the latter part of the week at $22. The iron is for delivery beginning in October, 1902, and running into next year at the rate of 200 tons a month.

The advance made by some of the Southern furnaces stimulated the demand for what iron the large interests had to offer at $16. There was a sale on Saturday of 1,500 tons of No. 4 Southern foundry at $15.25 Birmingham for September and October delivery. The demand has been well distributed through the list, though car wheel iron has probably been more sought by some large buyers. Prices at Cincinnati are a follows:

Southern Fdy. No. 1	$19 25 to 20 25	Gray Forge	$17 75 to 18 25
" " 2	18 75 to 19 75	Northern Fdy. No. 1	22 00 to 23 00
" " 3	18 25 to 19 25	" " 2	21 00 to 22 00
" " 4	17 75 to 18 75	Southern C. W. iron	23 75 to 24 75
So. Fdy No. 1 soft	19 25 to 20 25	Malleable coke iron	22 00 to 22 75
So. Fdy. No. 2 soft	18 75 to 19 75		

Finished Material.—The market for all kinds of finished material shows little change. The demand keeps up to the same proportions; deliveries are still the cause of the greatest dissatisfaction; and the various lines that need material report a very good business. Building operations are heavy in this city and district and jobbers are having a hard time trying to accumulate a little stock. Bar iron remains at 1.92c and bar steel at 1.72c, both iron and steel bars being quoted at 2.20c out of store. Angles are 2.35c and 2.50c out of store. Sheets are quoted at 2.50c for No. 12 and 2.35c for No. 10.

Old Material.—There is a good demand and a rather light offering of scrap iron. The railroads are beginning to offer more rails or to make deliveries to the various large scrap iron handlers here. Prices are firm, but show no decided advances. The following quotations are continued:

Old No 1 Wrought Railroad, net tons	$ 19 50 to 20 00
Cast Machine and Foundry, net tons	14 00 to 14 25
Old Iron Rails, gross tons	25 00
Old Steel Rails, gross tons	24 50 to 24 75
Old Short Lengths, gross tons	17 50 to 18 00
Old Iron Axles, gross tons	25 00
Old Iron Car Wheels, gross tons	19 00 to 19 50
Stove Plates, gross tons	11 00 to 11 25
Wrought Turnings, net tons	14 00
Cast Borings, net tons	8 50 to 8 75

PHILADELPHIA.

May 21.

The strike of the anthracite miners if continued for any length of time will tend to retard pig iron production in this district and will also be badly felt by the manufacturing industries in general. The fuel supply has been none too plentiful for several months and the stocks of coal on hand will not keep the wheels turning for many days. Coming at the same time as the unusual shortage of iron a coal famine will only aid in the closing of busy plants for the want of material to work with.

The scarcity of iron is unabated and the market in general may be said to be in a very unsettled condition. A good deal of foreign material is coming in, with more on the way, but delays are as common here as with domestic products. The stocks on hand even in the face of importations show a further shrinkage.

Pig Iron.—With the largest output on record the available supply amounts to almost nothing, and great difficulty is experienced in finding enough iron to take care of urgent requirements. At several mills labor difficulties have tended to ease consumption and quite a few foundries have been compelled to close a day or so at a time for lack of iron. Yet these interruptions will not tend to relieve the situation if production is to be shortened by the coal strike. Sales of iron are not heavy, principally on account of these being but little of this to deal in and again at present prices neither side cares very much to look too far ahead. Quotations for the balance of the year deliveries beginning late in the third quarter range about as follows: No. 1 X Foundry, $21 to $22; No. 2 X Foundry, $20 to $20.50; No. 2 plain, $19.50 to $20; standard gray forge, $18.75 to $19.50; ordinary gray forge, $18.25 to $18.50; Basic, $19 to $19.50. Where iron is wanted previous to September the figure at which this is obtainable is generally a private arrangement, although sales of No. 2 X for June and July shipment are recorded at $21 to $22.

Finished Material.—The capacity of the structural mills is taken up for so far ahead that no relief is to be expected except through importations. Anything which can be had within reasonable time is readily disposed of at full figures. Orders for bars and plates can not now be placed at less than 2c, and considerable transactions have been carried through at this figure. Deliveries are very uncertain in nearly all lines, even under the stimulation of offered premiums. For nearby deliveries the following range of prices prevail: Plates ¼-inch and thicker, 2c to 2.10c; steel bars, 1.85c to 1.95c; iron bars 2c to 2.05c; beams and channels, 1.90c to 2.10c; angles, 2c to 2.50c.

Old Material.—Both sides appear to be waiting for further developments, with holders disposed to insist on recent prices being maintained. With several concerns shut down for one reason or another, buyers are in no hurry to force the market. Bids and offers are about as follows for deliveries buyers' yards: Choice railroad scrap, $24 to $25; ordinary light scrap, $16 to $17; machinery cast, $18 to $18.50; heavy steel scrap, $21 to $22; old iron rails, $25 to $26; wrought turnings, $16 to $17; cast borings, $10 to $10.50; old iron axles, $26.50 to $28; old steel axles, $25 to $26; old car wheels, $19.50 to $20.50.

Puddlers' Strike in Central Pennsylvania.

(Special Telegram.)

Pittsburg, May 21.—The strike of the puddlers in Central Pennsylvania continues. Fully 1,500 men are out at the present time, the puddlers making a uniform demand for $4.50 per ton. The strike was started by the puddlers who are affiliated wtih the American Federation of Labor, and the Amalgamated Association lodge of finishers at Reading was drawn into the conflict as its members could not secure their regular supply of material. They have now made a demand for an 8 percent advance in wages and will receive an answer from the American Iron & Steel Mfg. Co. today. If their demands are granted they will return to work providing material can be secured. The men employed by the Reading Iron Co. continue at work, having been promised an advance to $4.50 per ton on June 1. The men employed by the Susquehanna Iron & Steel Co., at Columbia, Pa., are still out. At Lancaster, Pa., the puddlers are also out.

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G. H. GARDNER, President and Treasurer.
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A. I. FINDLEY, Secretary.

A. I. FINDLEY, - - - - - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT

CHICAGO: 519 Monadnock Block, GEO. H. GRIFFITHS, Manager.
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THE STEEL CORPORATION AND ITS OUTPUT.

The recently published statistics of production of constituent companies of the United States Steel Corporation in the fiscal year ending March 31, 1902, heightened previous impressions of the vastness of the corporation's resources and operations.

In iron ore the steel corporation mines contributed 46 percent of the entire production of the country for 1901. The official figures just given out by the United States Geological Survey show a total of 28,887,479 gross tons produced in this country last year. The steel corporation properties produced 13,326,705 gross tons. The percentage in units of iron to be credited the steel corporation is greater than 46, since its ores, as with nearly all the product of the Lake Superior region, run considerably higher in iron than the average for the iron mines of the United States.

The pig iron production of the corporation, including spiegel and ferro-manganese, was 7,152,121 tons, equal to 45 percent of the total production in the United States in the calendar year 1901. In its first year the steel corporation thus exceeded the pig iron output of the entire country in either 1893 or 1894—the figures for the former year being 7,124,502 tons and for the latter, 6,657,388 tons.

In steel the pre-eminence of the aggregated companies is most marked. The Bessemer steel output was 72 percent of that for the country in 1901 and the open-hearth output 60 percent. Compared with the total steel production of the country in 1901—13,369,613 tons—the corporation's output of ingots, 9,034,580 tons, was 67 percent. It was over 80 percent of the combined steel production of Great Britain and Germany last year, the former producing 4,850,000 tons and the latter 6,394,222 tons.

The statement of finished products accents the dominating position of certain of the constituent companies in a way that is not indicated by the figures for ore, pig iron and unfinished steel. The output of rails is relatively small, however. It was 1,675,628 tons, or but 59 percent of the 2,836,273 tons produced in the United States in 1901. The plate and sheet tonnages are also far from indicating monopoly. Of plates the total was 742,508 tons and of sheets 415,299 tons, the strike making an inroad upon possible production in this line. The official figures for 1901 are not at hand, but in 1900 the production of plate and sheet iron and steel in the United States, excluding nail plate and skelp, was 1,794,528 gross tons, and in 1889, 1,903,505 tons.

The predictions made last year of a rapid reduction of the percentage of the country's wire product made by the American Steel & Wire Co., in view of the building of independent plants, must look to the future for their fulfillment. The country's production of wire rods in 1901 was 1,365,934 tons, of which a certain percentage went into consumption as rods and were not drawn into wire. The American Steel & Wire Co.'s production of wire and wire products in the fiscal year ending March 31, 1902, was 1,078,838 tons. Probably 85 percent of the wire and wire products of the country came from its mills.

Commenting on the production of the American Tin Plate Co. in the twelve months ending March 31—404,746 tons—*Tin and Terne* says: "No statistics of general tin plate production are available beyond the end of 1900, but the American Iron and Steel Association gives the production of the whole country in 1899 as 360,875 tons, and in 1900 as 302,665 tons. If there were no tin plate production by any independent companies, the increase in fifteen months from 303,000 tons to 405,000 tons would be very noteworthy. Even assuming that independent mills contributed but slightly to the 1900 production of 303,000 tons, the increased production of the American Tin Plate Co. is very striking, while considering on the other hand that in the year ended March 31 last independent mills were making considerable quantities of tin plate, the increase in the country's production has evidently been very large."

In tubes and pipes the corporation's proportion of the country's output is high. Its total of 693,655 tons for the twelve-month is probably above 85 percent of the whole. Competition is growing, but thus far has not been an important market factor.

Under "merchant steel, shapes, bars, hoops and bands," a total of 1,236,343 tons is given. Here comparisons are impossible. The figures represent approximately the outputs of the Carnegie structural and bar mills, the American Steel Hoop Co. and the Milwaukee plant of the Illinois Steel Co.

Almost staggering is the size of the working army employed by steel corporation companies—an average of 158,263 employes in service during the year. Dividing this into $112,829,198.41, the total wages paid, gives an average year's earnings of $713 for each employe. It is impossible to make deductions as to the percentage of labor cost, but something is suggested in the figures given for steel manufacturing properties. From these the shipments (including those between constituent companies) were 10,970,768 tons, of a selling value of $410,643,625.39 and representing a manufacturing cost of $315,662,881.63. It would be interesting to know whether the statement of wages paid represents merely the wage outlay in operation, or whether the salaries for administration and distribution

are included. While not given to the public as a study in economics, or as an answer to all the questions that might be asked concerning the results of consolidation, the statement is most suggestive. Should it be followed each year by others covering the same items, important deductions may be possible.

Conferences on Scale Footnotes.

(Special Telegram.)

PITTSBURG, May 21.—The conference for the adjustment of footnotes and other regulations of the bar iron scale will be held between the bar iron manufacturers, represented by the Republic Iron & Steel Co., and a conference committee of the Amalgamated Association at Columbus, O., on Tuesday, May 27. The conference will in no way touch upon the question of wages, as that matter was arranged before the Amalgamated convention was held. The conferences for the adjustment of the footnotes of the tin plate and sheet scales will be held early in June with the American Tin Plate Co. and the American Sheet Steel Co. respectively.

The Deering Harvester Co.'s Steel Plant.

(Special Telegram.)

CHICAGO, May 21.—The plans for the new steel plant to be erected at South Chicago by the Deering Harvester Co., manufacturers of agricultural implements, provide for an open-hearth plant of 14 furnaces having 40 tons daily capacity each. Only seven of the furnaces are to be built at present. The finishing mills will consist of 8-, 9-, 12- and 16-inch merchant mills, 22-, 26- and 28-inch plate mills and a 32-inch blooming mill. The daily output will amount to nearly 600 tons, and all the steel produced will be consumed by the company, none being offered on the open market. Julian Kennedy, of Pittsburg, has been retained as engineer. The contract for the blooming mill has been awarded to Mackintosh, Hemphill & Co., of Pittsburg.

Open-Hearth Steel Plant at Canton, O.

(Special Telegram.)

PITTSBURG, May 21.—Interests allied with the Stark Rolling Mill Co. and the Carnahan Tin Plate & Sheet Co., of Canton, O., have decided to organize a new company for the purpose of operating an open-hearth plant to supply both concerns. Three open-hearth furnaces of 40 tons capacity each will be built. Plans have been prepared and provisions made for doubling the plant should the demands require an increase. Victor Beutner, of this city, is consulting engineer.

Atlantic Furnace Transfer.

(Special Telegram.)

PITTSBURG, May 21.—The Republic Iron & Steel Co. has formally taken over the Atlantic Furnace, operated by the Atlantic Iron & Steel Co., New Castle, Pa. The stock of the company has been nominally the property of the Republic Iron & Steel Co. since its organization, but according to the agreement entered into at the time the furnace was to continue in operation under the Atlantic Iron & Steel Co. for a period of two years. That time has now expired. The furnace was blown out in April for relining and will shortly go into blast again. It has an annual output of 95,000 tons of Bessemer iron. Charles Hart, superintendent of blast furnaces of the Youngstown District of the Republic Iron & Steel Co., will have charge of its operation.

The Cleveland Engineering Co. announces that it has opened an office in the New England Bldg., Cleveland, for the business of consulting engineering. The firm is prepared to furnish estimates and specifications, to superintend the installation and make final tests of plants for power transmission, for lighting, heating and ventilating, storage battery equipment and electric railways, and will also make efficiency tests on existing plants.

PERSONAL.

It is reliably reported that Frank H. Buhl, of Sharon, Pa., has disposed of his entire interest in the Sharon Steel Co., amounting to 2,650 shares of stock, George W. Darr, of the firm of Darr, Luke & Moore, of New York, being the purchaser. About a year ago Mr. Darr succeeded Mr. Buhl as president of the company.

George Forrester, superintendent of the open-hearth department of the Homestead plant of the Carnegie Steel Co., Homestead, Pa., accompanied by his wife sailed for Europe this week. The trip was awarded Mr. Forrester for faithful services rendered.

Maurice Varella, editor and president of *Matin*, of Paris, France, accompanied by his brother, Phillip Varella, spent several days in Pittsburg last week inspecting the industrial plants in that district.

J. W. Duntley, president of the Chicago Pneumatic Tool Co., accompanied by E. N. Hurley, former president of the Standard Tool Co., of Chicago, returned from England last week on the Kaiser Wilhelm der Grosse. Mr. Duntley said that the deal for the purchase of the International Tool Co. was not entirely closed, but it is expected that the plant will be secured.

Herman E. Dick, of Chicago, representing the Edison Iron Ore Extracting Co., returned from Norway last week on the Kaiser Wilhelm der Grosse.

R. W. Finlayson, representing H. P. Gregory & Co., of Sydney and Melbourne, Australia, spent several days in Milwaukee, Wis., last week inspecting the shops of the Allis-Chalmers Co.

Ambrose Beard has been appointed western superintendent of the plants of the American Sheet Steel Co. He was formerly manager of the Midland plant at Muncie, Ind.

Frank McCreary, for several years agent for the Philadelphia & Reading Coal Co., at Duluth, Minn., has been made superintendent of the Stevenson mine at Hibbing owned and operated by Corrigan, McKinney & Co. T. Z. Collins succeeds Mr. McCreary at Duluth.

Charles H. Todd, of the Petroleum Iron Works, of Washington, Pa., left for New Orleans and Beaumont, Tex., last week, where his concern has a large amount of work on hand.

Joseph E. Schwab, of Pittsburg, sailed for Europe this week on an extended tour.

Matthew A. McLean, chief draughtsman, and T. S. Scott, assistant chief draughtsman of the Westinghouse Electric & Mfg. Co., Pittsburg, accompanied by their families sailed for England this week to accept similar positions with the British Westinghouse Co., at Manchester, Eng.

A banquet to department managers was given by the Republic Iron & Steel Co., at Youngstown, O., on Wednesday evening. Responses to toasts were made by Y. B. Haagsma, auditor, of Chicago; John McLauchlan, head of the credit department, Chicago; J. C. Corns, Massillon, O.; W. L. Simonton, general manager, Chicago; Harry Bonnell, Harry Parrock, Wm. Henderson and James Nutt.

Clement F. Street, until recently with the Dayton Malleable Iron Co., has accepted a position with the Wellman-Seaver-Morgan Engineering Co., of Cleveland.

President C. M. Schwab, of the United States Steel Corporation, recently purchased Richmond Beach on the south shore of Staten Island. It is the intention to use the resort as a free place of outing for poor and sick children of New York. From 1,500 to 2,000 children can be provided for daily.

J. W. Brainard, district sales manager of the American Steel Hoop Co., with headquarters in Cleveland previous to the absorption of that company by the Carnegie Steel Co., and more recently connected with the Cleveland office of the latter company, has been promoted to the general sales offices in Pittsburg and will have charge of the entire business in hoops.

A. H. Swartz, superintendent of steam power at of the Ohio works of the National Steel Co., Youngstown, O., has resigned to accept a similar position with the Republic Iron & Steel Co., having charge of the entire Youngstown district.

J. S. Colyar, manager of the furnace properties of the Tennessee Coal, Iron & Railroad Co., at Sheffield, Ala., has resigned to accept a similar position with the Sloss-Sheffield Steel & Iron Co., at Florence, Ala. Irving D. Miller has been

appointed Mr. Colyar's successor. T. L. Haughton has been appointed manager of the city and North Birmingham furnaces of the Sloss-Sheffield Steel & Iron Co., at Birmingham, Ala.

Emil Swensson, consulting and constructing engineer, 925 Frick Building, Pittsburg, has been appointed consulting engineer to the Rapid Transit Commission, of Pittsburg, appointed some time ago by the city recorder, J. O. Brown, to consider the traction situation and remedies for the congested condition in that city. The commisssion consists of Reuben Miller, A. J. Logan, H. C. Frick, Wm. McConway and J. R. Mellon.

At a meeting of the board of directors of the Crucible Steel Co. of America, held in Pittsburg Tuesday, May 20, Reuben Miller who resigned recently, was re-elected to the board. No other changes were made, though it had been reported that the names of two Pittsburg capitalists heretofore prominent in steel manufacture would be added.

J. P. Allen has resigned as assistant general sales agent for the American Steel Casting Co., to accept the superintendency of the new plant of the Railway Steel Casting Co., of Pittsburg, recently chartered, which will be erected at Tarentum, Pa.

At a meeting of the directors of the Youngstown Mfg. Co., Youngstown, O., held this week, Edwin McEwen was elected president vice Thomas McDonald, resigned; S. B. E. McVay was elected vice president and Whitney Warner, secretary and treasurer.

W. R. Woodford, formerly general superintendent of the Pittsburg district for the Baltimore & Ohio Railroad, has accepted the position of second vice president of the Pittsburg Coal Co., Pittsburg, Pa., the change to take effect June 6.

A FIRE BRICK CONSOLIDATION.

The American Refractories Co. is the name of a new consolidation that will shortly be launched with $22,500,000 capital and which will include the plants of ten manufacturers of high grade fire and silica brick. The combination was affected by T. L. Chadbourne, Jr., of New York, who has been working on the project for five months. For several years efforts have been made to consolidate the fire brick manufacturers not only in the western and central portions of Pennsylvania but in Eastern and Southern Ohio as well. In each case the projected consolidation has fallen through. A charter will be secured in New Jersey and the headquarters of the company will be established in Pittsburg. The capital will be divided in approximately $8,000,000 of 6 percent cumulative preferred stock and $14,500,000 of common shares. The company will also issue about $3,500,000 of 5 percent gold bonds which will be used in part in refunding outstanding issues. The securities will be underwritten by a syndicate represented by Mr. Chadbourne. The company will be launched with a working capital of about $2,000,000.

The properties absorbed in addition to 27 plants for the manufacture of high grade brick, include 52,000 acres of coal, fire clay and ganister land. The plants have a daily output of 800,000 brick. The plants of the following companies have been taken into the consolidation: Harbison-Walker Co., Isaac Reese & Sons Co., Phillipsburg Fire Brick Co., Basic Brick Co., Clearfield Fire Brick Co., Wallaceton Fire Brick Co., Clinton County Fire Brick Co., Fredericks, Munro & Co., American Fire Brick Co. and the Layton plant of the Fayette Mfg. Co. The directors will be 15 in number and will probably include H. F. Bigler, Clearfield; F. H. Wigton, of the Phillipsburg Co., of Philadelphia; H. W. Croft, of the Harbison-Walker Co.; George Reese, S. C. Walker, of the Harbison-Walker Co.; R. W. Fredericks, Alexander Patterson, of the Wallaceton Co., of Clearfield; Moore Fredericks, of Clearfield county; S. P. Harbison, of the Harbison-Walker Co.; F. H. Seeley of Altoona, of the Basic Brick Co.; two directors to represent the New York portion of the underwriting syndicate and two to represent Chicago. The demand for all kinds of refractories is larger now than ever in the history of the trade, while prices have advanced materially in the past few months.

The Santa Fe Railroad will erect a machine shop at Topeka, Kas., 800 feet long and 300 feet wide.

THE STEEL CASTING CONSOLIDATION.

(Special Correspondence.)

NEW YORK, May 19.—So much progress has been made by the promoters of the steel casting consolidation, of which some details were given in these columns last week, that *The Iron Trade Review* can state on the most reliable authority that application for a certificate of incorporation will be made in New Jersey in a few days. The concerns represented in the proposed consolidation are as follows:

American Steel Casting Co., of New Jersey, with active plants at Thurlow, Pa.; Sharon, Pa.; and Alliance, O., and unoperated plants at Norristown, Pa.; Syracuse, N. Y.; and Pittsburg.

Reliance Steel Casting Co., Limited, of Pittsburg.

Leighton & Howard Steel Co., of St. Louis, Mo.

Franklin Steel Casting Co., of Franklin, Pa.

The Sargent Co., of Chicago.

American Steel Foundry Co., of St. Louis, Mo.

The proposed company will have a capitalization of $40,000,000, of which $20,000,000 will be in 7 percent cumulative preferred, both as regards assets and dividends, and $20,000,000 in common stock. The intention at present is to issue $7,500,000 of each class at once. The underwriting is in charge of Harris, Gates & Co., of No. 10 Wall St. According to the articles of agreement, which are dated May 12, 1902, and which are to mature at the end of eighteen months, Harris, Gates & Co. agree to form a syndicate, which will purchase for $6,000,000 cash, $6,000,000 par value of preferred stock, and $6,000,000 par value of common stock, when issued. It is also agreed that Harris, Gates & Co. shall have exclusive control of the stock during the life of the syndicate, to be retained by them, or sold or disposed of as they may deem proper. The articles of agreement also vest them with full power to buy, sell, rebuy and resell, stock in any amount conducive to the best interests of the syndicate.

The legal end of the consolidation is being looked after by Max Pam. To a representative of *The Iron Trade Review* Mr. Pam said that all of the details of the consolidation were perfected, and that articles of incorporation would in all probability be applied for in a few days. When asked if the concerns to be absorbed would continue to be operated as at present, or whether they would be operated from a central office, Mr. Pam replied that nothing definite had been decided upon in that connection. From another source, however, it was learned that there was every probability that the policy pursued by the United States Steel Corporation will be followed, which in effect means that each of the amalgamated companies will preserve its identity as at present. It is probable that the new corporation will be known as "The American Steel Foundries."

The directory will contain the names of several men prominently identified with the steel industry, including Charles M. Schwab, Elbert H. Gary, and John W. Gates. Mr. Gates left New York on Saturday to interest some of his friends in the West in the new enterprise.

At the office of Harris, Gates & Co. it was stated that there was no doubt whatever of the final success of the consolidation. It was also said that experts were now engaged in formulating statistics of the companies represented in the consolidation, to be embodied in a prospectus for the consideration of proposed stockholders.

The following letter has been sent out:

"Dear Sir:—We are forming a syndicate for the purchase of $6,000,000 preferred stock and $6,000,000 common stock of the proposed 'American Steel Foundries.' This company is being formed to acquire the various plants mentioned in the syndicate agreement sent you. Persons familiar with the steel business in all its phases are prominent in participating in the underwriting.

"We as syndicate managers retain entire control and disposition during the life of the syndicate, not only of all the syndicate stock, but the entire common stock issued, the only preferred stock not within our control being that taken by manufacturers in part payment for their properties. It has been suggested to us by the subscribers and parties in interest that you might desire to participate in the syndicate and, pursuant to that suggestion, we send you this letter. Copies of syndicate agreement are herewith submitted, one of which you may retain for your files and the other you may sign and return to us, if you see fit.

Yours truly,

"Harris, Gates & Co."

NOTES OF THE ENGLISH IRON TRADE.

MANCHESTER, ENG., May 10.—Much interest has centered on the case of Cowen vs. Labouchere. In this action Mr. Lawrence Cowen, secretary of the Article Club, seeks to recover damages from Henry Labouchere, M. P., and Horace Voules, as proprietor and editor respectively of London *Truth* for alleged libel. The Doherty iron castings process is not unknown to fame. It was exploited in Canada and the United States and readers of *The Iron Trade Review* will be interested in Mr. Cowen's connection with the company that floated the process in England. Accordingly I make a few selections from the evidence as reported in the daily press.

"Now about the Doherty Process Co. How did you become connected with it?" the plaintiff was asked.

Mr. Cowen replied: "I was shown some iron with holes punched in it. The man who showed it to me said that scrap cast iron could be made to produce an iron almost equal to wrought iron. I was told if I went down to Liverpool and saw the English patentees I should be first in the field. I went to Liverpool and met those men. When they were seen it was agreed that the process should be worked in the foundries of the firm who introduced the process. This was done and it proved to be able to do what was claimed for it. Certain other influential experts also saw the process and were convinced that it would revolutionize the iron industry. Further experiments were ultimately made with the most successful results. We saw the experiments carried out and in a very few hours the necessary capital for the formation of a syndicate was subscribed. No public money was brought into it at all."

"Was the test perfectly independent?" "Yes."

"Were the results seen by those present?" "Yes."

"And they formed the opinion that it was really a valuable thing?" "Certainly."

"So far as you are concerned did you honestly believe in the thing at the time?" "Yes, I did, and do so still."

The foregoing information was elicited in an examination conducted by Mr. Isaacs, the plaintiff's (Mr. Cowen) counsel. However in cross-examination by Sir E. Clarke, counsel for Mr. Labouchere, further detailed facts are obtained.

Mr. Cowen—With regard to the Doherty Iron Castings Process Co., five of the directors were members of the Article Club, Lord Suffield being chairman of the company. The price the promoters paid to Doherty was £30,000 in cash and £25,000 in shares. The articles of association of the company provided that the directors' remuneration should be £3,000 a year and a further amount of 10 percent after a cumulative dividend of 10 percent had been paid to the shareholders. The promoters sold the patents to the company for £85,000 payable as to £50,000 in cash and the balace of £35,000 in shares. By the 30th day of July, 1898, the £50,000 cash had been paid to the promoters by the company. The total number of shares taken up was 98,000 and £68,000 was called up, of which £59,000 was actually received. In February, 1899, a petition was presented for the winding up of the company and the company did come to an end in that month. The assets of the company at the date of the winding up consisted of the patents only. The accounts showed a deficiency of £101,000, the cash at the banker's being 11s, 9d.

Sir E. Clarke—The capital was all gone, was it not, and there was still a deficiency of £2,501 towards meeting the liabilities of the company?

Mr. Lawson, one of the plaintiff's counsel—That was the whole of the cash deficiency—£2,501.

Mr. Justice Lawrance—Do you mean that the promoters put the whole of the £101,000 into their pockets?

Sir E. Clarke—Oh, no, my Lord. What they put into their pockets was the difference between the amount paid up and what they paid the vendors.

Mr. Cowen—There were two promoters, and my share of the profit was about £8,000, but that was apart from what I put back into the company. My net profit was about £5,000.

The assets of the company when it went into liquidation and the net profit of one of the promoters of the company are items well worth noting.

A story comes along which is too good to pass by. A party of students in charge of a lecturer were doing the rounds of a certain steel works and as the various departments were passed through a brief description of the process and plant employed was given. When the party reached the steel melting department the manager, anxious to gather a little grain, fell in with the rear and heard with satisfaction the lecturer's intention to measure the temperature of one of the open-hearth furnaces. An optical pyrometer was accordingly fixed in line with one of the charging doors and word passed along to hoist the door a little. After some adjusting of the prisms the statement came forth: "Gentlemen, the temperature of this furnace is 1,100 degrees Centigrade. We will now pass on."

Picture the astonishment of the aforementioned manager who knew that the furnace contained 25 tons of dead mild steel almost ready for tapping.

A notable feat has been achieved recently by the Parkgate Iron & Steel Co. A part of the scheme in reorganizing the works demanded the installation of overhead cranes, which in turn necessitated the raising of existing roofs 15 feet. It was determined to perform this at one operation and hydraulic lifting tackle was designed for the purpose. On Sunday, April 27, the lifts were commenced and the whole job completed in about six hours. Two roofs of 60-feet span were lifted with no interruption to the ordinary working routine and no damage to the roofs. A further lift will be of three roofs, each 60-feet span, which are to be lifted simultaneously.

PERCY LONGMUIR.

Jones & Laughlins, Ltd., Pittsburg, Pa., will place in operation next week two additional acid open-hearth furnaces at their Soho plant. The furnaces have a capacity of 25 tons each and will have a daily capacity of about 100 tons. The Talbot furnace which was erected at the South Side plant will also be in operation early in June. The furnace is the largest of its type ever constructed and will have a daily capacity of 400 tons.

The Budke Iron & Steel Co. is being organized at Pittsburg with $850,000 capital for the purpose of erecting a sheet plant at Shannopin on the Ohio River below Pittsburg. Options have already been secured on 157 acres of land which will furnish a site for the plant together with commodious quarters for the workmen. The plant will be modern in every particular and will consist of a main building 100 feet wide and 150 feet long, a puddle and knobbling mill 200 feet long and 60 feet wide, a sheet mill, 325 feet by 113 feet, and a boiler house 100 feet by 80 feet. The mills will be equipped with four stands of finishing rolls, six stands of hot rolls, three stands of roughing rolls, one 25-ton electric crane, one 4-ton steam hammer, eight puddling furnaces, eight knobbling fires, one stand three-high bar mill, and it is contemplated to erect in the future an open-hearth steel plant to give the company an independent supply of steel.

The Cleveland Pneumatic Tool Co., of Cleveland, has appointed the Compressed Air Machinery Co., of San Francisco, to represent it on the Pacific Coast.

The Watt Mining Car Wheel Co., Barnesville, O., announces that no change in policy or in the management of the business will result from the death of its president, James Huston Watt, which has been already noted in these columns.

Officers of the Cuyahoga Wire & Fence Co., recently incorporated with $1,000,000, and which took over the plants of the Cuyahoga Wire & Steel Co., of Cuyahoga Falls, O., and the Hartman Mfg. Co., of New Castle, Pa., are as follows: E. A. Henry, president; William Logan, vice president; D. Duthery, treasurer. The officers named, together with Robert Parker, S. H. Miller, Charles D. Backus and L. McLanahan, compose the board of directors.

It is reported at Scranton, Pa., that the Lackawanna railroad is negotiating for the purchase of the site on which the South St. mills stood. It is the purpose of the company to erect a large locomotive plant. Opposite these works on the other side of the Lackawanna road the company will erect new car shops.

IRON AND MACHINERY EXHIBITS AT DUSSELDORF.

The exposition of the industries and trades of the Rhineland and Westphalia, which opened at Düsseldorf May 1, promises to be of exceptional importance. The crown prince of the German Empire has undertaken the office of patron. P. Lieber, United States Consul at Düsseldorf, has sent some details of the exposition to the State Department, from which we take the following:

The exposition comprises 25 groups, which are to illustrate the several trades flourishing in this part of Germany, the social, sanitary, and educational institutions of the provinces, their agriculture, horticulture, arts and craft. The grounds cover an area of 150 acres, and there are now erected over 160 edifices, representing a value of $2,500,000. The mining of ore and coal, the production of iron, steel, and other metals, the manufacture of articles in foundries, rolling mills, and machine shops, and the electrical industry are the trades most conspicuous in the well known manufacturing districts of the Rhineland and Westphalia. The manufacturers and iron masters, being unable to properly display the development of their industries at the Paris exposition, on account of lack of space, resolved to arrange the present undertaking. At that time, the German iron and steel industry and kindred trades were at the height of their glory; since then, however, these industries have undergone serious depression, and it might have been expected that the exhibition would lose thereby. On the contrary, every detail of the original program has been executed, and vast amounts of money have been expended. Never at any world's exhibition, it is said, were these industries represented in such completeness as on this occasion. The committee strictly refuses anything which is not worthy of exhibition.

Krupp's exhibition building is over 400 feet in length, with iron-clad towers and a military mast 165 feet in height. It will include an arsenal of land and naval artillery, ranging from small cannons placed in the turrets of the military mast to gigantic guns with all appliances of latest construction. There will be a complete stem and stern of a German battle ship and an armor plate of 130 metric tons in weight. Models of ships and shipbuilding establishments and many other exhibits of warfare will be shown by the firm. There will also be a complete shaft, with screw, intended for the large passenger steamer, Kaiser Wilhelm der Grosse, a 40-ton railroad car, a sheet of tin of 100 square meters (1,076 square feet), whole mining plants, and machinery.

The exhibits of the other large firms, among which the most prominent are the Gutehoffnungshuette in Oberhausen, Bochumer Verein, Rheinische Metallwaaren- und Maschinenfabrik, Hoerder Bergwerks- und Huettenverein, Deutzer Gasmotoren-Fabrik, are not less important. They contain such specialties as a roller carrier 20 meters (65.6 feet) in length, boiler bottoms, railroad tracks; a twin tandem engine, which raises 4,400 kilograms (9,700 pounds) of material from a depth of 750 meters (2,450 feet), at a rate of 12 meters (47 feet) per second; and a blast furnace blowing engine with a 1,000-horsepower gas motor. These machines may be seen in operation. The mining trades will have exhibits to demonstrate the several stages in the development of the mining industry of these provinces during the last two decades, and will show in operation a whole mining shaft, with all the wood-framing, ventilators, pumps, and other machinery.

Exhibitors who have not erected their own pavilions will be represented in the machinery hall, which covers an area of 5 acres, not including the buildings for boilers, pumps, etc. The central station (15,000 h. p.) for the generation of electric light and power for the exposition has its place in this hall. Electricity will be used for operating all the machinery on the grounds, for lighting 1,000 arc lights and over 40,000 incandescent lamps, and for supplying power to a railroad which makes the circuit of the exhibition.

A number of congresses will meet in Düsseldorf during the exhibition season. One of the largest is the international river navigation congress, to which the German Government contributed 100,000 marks; also that of the German Shipbuilding Society, in which the English Institute of Naval Architects and the French Technical Maritime Association will officially take part; congresses of the German electrical engineers, the German chemists, the gas and water engineers, the paper union, the banking companies and the international congress for workmen's insurance and on the housing question are among others.

STEEL CORPORATION CONVERSION PLAN.

At a special meeting of stockholders in Hoboken, N. J., Monday, May 19, the plan of the United States Steel Corporation to convert $200,000,000 of preferred stock into 5 percent bonds and to issue additional 50,000,000 of 5 percent bonds to provide working capital was approved by the stockholders almost unanimously. The vote in favor aggregated 3,745,238 shares of the preferred and 3,956,245 shares of the common. Only 12,543 shares opposed the proposition. Protests were made by several stockholders, particularly because of the $10,000,000 commission which the syndicate will receive, and a motion was made to adjourn the meeting for one month, that stockholders might have more time to examine into the matter. This was voted down.

After the meeting Geo. W. Perkins, chairman of the finance committee, made this statement: "When we found it necessary to raise more money to complete and perfect our plan we considered two propositions. The first one was to sell $50,000,000 preferred stock. This stock we could probably have placed at 90. That would have ben an initial loss of $5,000,000 on the par value. This new issue would also call for 7 percent interest, or $3,000,000 per year, and for every year thereafter. The second proposition was to sell $50,000,000 of second mortgage 5 percent bonds. These bonds would probably have been placed at 95, and that would have meant an initial loss of $2,500,000. Neither of these schemes seemed to meet the situation and were open to criticism. The third scheme was then considered, namely, to raise $250,000,000 by exchanging $200,000,000 of the 7 per cent preferred stock for an equal amount of 5 percent second mortgage bonds and $50,000,000 of such bonds for cash. The interest at 7 percent on $200,000,000 of preferred stock equals $14,000,000 per year. The interest on $250,000,000 second mortgage bonds at 5 percent would equal $12,500,000 per year, a saving of $1,500,000 per year. To carry this plan out commissions of 4 per cent would be required by the syndicate. This would mean an initial expense of $10,000,000, but the third plan provides for a sinking fund which would wipe out the $10,000,000 cost in less than ten years and would provide for the payment of the entire bond issue in sixty years."

Obituary.

Gordon H. Gile, president of the Colby Bessemer Iron Co. and treasurer of the Northern Chief Iron Co. and one of the most widely known iron ore experts in the Lake Superior region, died at his home, Oshkosh, Wis., on May 10. He was an invalid for many years.

Patrick Henry, superintendent of the New Castle plants of the American Tin Plate Co., passed away at his home in Pittsburg on May 18. He was born in Pittsburg on Sept. 22, 1861, and was expert in tin plate manufacture.

The American Furnace & Machine Co., of Pittsburg, writes as follows concerning the recently published statement that it would take over the firm of Wm. Swindell & Bros.: "This is incorrect. They have no connection with us whatever. We will, however, take over the successful business of James H. Swindell, who is erecting several large plants at the present time, and will control the patent furnaces, gas producers and tin plate and sheet mill labor-saving machines, invented by James D. and James H. Swindell. The Colorado Fuel & Iron Co. are installing at present 22 sets of the Swindell annealing charger, which is one of these machines. We are located in the Publication Bldg., Pittsburg."

The Lackawanna Steel Co., Buffalo, N. Y., will probably blow in two of its furnaces in September. The building of the docks and the canal is progressing favorably and the erection of the rail mill is well along. Present indications point to the beginning of operations in the rail mill before the end of the year.

The Jones Mixer Decision.

We have already recorded the fact of the decision given in the United States Supreme Court on May 5, at Washington, in the case of the Carnegie Steel Co., Ltd., against the Cambria Iron Co., originally brought in the Circuit Court for the Western District of Pennsylvania, to recover damages for the infringement of letters patent issued June 4, 1889, to Wm. R. Jones, "for a method of mixing molten pig metal." The full texts of the decision of the majority of the court (given by Justice Brown, four other justices joining with him) and of the dissenting opinion given by Justice White, three other justices joining with him, are now available. If given in full they would occupy about half the reading space in this issue of *The Iron Trade Review*. They are interesting for the extent to which they go into the intricacies of the Bessemer process, largely on the side of the mechanical manipulations involved, and are valuable as well for the historical data furnished relative to the evolution of Bessemer practice in the United States.

The majority decision takes up the issues under three heads: first, the claim of anticipation put forward by the attorneys for the Cambria Iron Co.; second, the criticisms made by the defendants on the phraseology of the Jones patent and the amendments introduced in the Patent Office after the original rejection of Jones' application—the purpose being to show that Jones did not understand what he had invented or that the specification did not contain "such full, clear, concise and exact terms as to enable any person skilled in the art to make, construct, compound and use the same"; third, the question of infringement.

The defendants laid stress on the use of intermediate ladles into which cupola metal was drawn both in foundries and steel works, before the Jones patent. The Durfee and Witherow patents on the use of direct metal were cited, and the Whitney process in car wheel making, as described in Kirk's "Founding of Metals." The gist of the court's opinion under this head is contained in the following extract:

"To enable the Jones process to be successfully carried out it is necessary (1) that the intermediate reservoir or mixer should be of large size, 'say 100 tons' capacity; (2) that it be covered to prevent the access of cold air from without; (3) that it be provided with a stop, so that it may not be tilted so far as to be emptied of its contents; (4) that a quantity of molten metal so large as to absorb all the variations of the product of the blast furnace received into it and thus to unify the metals discharged into the converters, be constantly retained in it. None of the prior patents or processes to which we are referred meets these requirements."

On the question of infringement we quote the decision in full as follows:

The question of infringement only remains to be considered, and, in the view we have taken of the prior devices, presents no serious difficulty. The Court of Appeals was of opinion that "the defendant's reservoir, or accumulating ladle complained of, is the same in principle as one which has been in use at the Cambria works ever since Bessemer steel was first manufactured, there with only this difference, that at first it was used at cupola, now at furnace." If such were the fact, of course defendant would not be open to the charge of infringement. Undoubtedly it has the right to make use of all prior devices, and particularly such as had been used at its own manufactory. In order to understand the device made use of by the defendant prior to the Jones invention, we reproduce herewith two small but easily understood cuts, taken from its brief, showing the character of the ladle known as the Bessemer intermediate ladle, used by it and generally by all American mills manufacturing steel by the Bessemer process.

It appears elsewhere in the testimony that the intermediate reservoir or ladle was from 15 to 18 tons capacity, and the converter from 6 to 8 tons; that the molten metal was tapped from the cupolas into the reservoir and withdrawn for the converter, and as the intermediate ladle held considerably more than the amount of metal necessary to charge a converter, there was some incidental mixing; but the main and perhaps the only purpose of the reservoir was for storage, and that if any quantity of metal were left in the reservoir it was by accident rather than by design. It will be noticed, too, that the reservoir was open at the top. It does not appear to have been made use of in carrying out what is known as the direct process, the difference being that the cupola practice furnished a metal for the Bessemer converter that was uniform in composition, or practically so, while the direct metal was largely variable in composition.

The testimony further shows that, after the installation of the Jones mixer at the Edgar Thomson works, Mr. Morgan, the defendant's mechanical engineer, visited and inspected these works and obtained information as to their practical operation, and was advised by the superintendent as to the location and proper size of the mixer and its contiguity to the converters. Mr. Morgan does not deny this conversation, although he qualifies it by saying that he thought the Jones apparatus had grave defects. Shortly after this visit, and in the latter part of 1895, defendant installed an apparatus of its own for the operation of the direct process, which is herewith produced upon a small scale, and in comparison with the Jones process. It consisted of a covered refractory lined and turtle-shaped vessel of about 300 tons capacity arranged to tilt, and having a spout at either side for receiving and pouring out the metal. The metal was brought to the mixer and poured in at one end, and through a spout on the other side, was poured into a ladle, which supplied the Bessemer converters. The metal was supplied both from blast furnaces and cupolas, the former furnishing about two-thirds, the latter about one-third of the metal used; but the metal from the cupola system was delivered by a ladle to the converter direct, and not through the reservoir. The metal from the blast furnace entered the reservoir in about 15-ton ladle lots, and was withdrawn in approximately 12-ton lots. The chief engineer of the company states that "in accordance with the natural way of using the reservoir, it is ordinarily kept well filled up." That in the practical operation of the mixer or reservoir a large quantity of iron was retained for mixing purposes is evident from the fact that a chalk mark was made on the side of the mixer, which was not allowed to run below the floor, as a guide to the men who rotated or tilted the mixer, since, if the mark went below the floor and out of sight, they could not tell how much iron was left in the mixer. Under these instructions not to allow the chalk mark to go below the floor there was retained in the mixer about 175 tons of molten metal, amply sufficient for the purposes stated in the Jones patent. Its principle of construction was similar to that of the Jones mixer, and its operation identical. Indeed, defendant's engineer himself says: "With the exception of additions of cupola metal I do not know that there is any material difference between our practice and that described in the second claim" of the Jones patent. We agree, in the opinion of the Circuit Court, that "it is quite clear, in view of these facts, that infringement takes place. That initial mixing rather than storage is the purpose of the reservoir is shown by the fact that the cupola metal is not stored, but served direct in ladles to the converter plant. And that the homogeneous mixture, once obtained, is used as a dominant pool to produce a graduated, non-abrupt product, is shown by the chalk line minimum limit of 175 tons. With such a permanent dominant pool in constant use, we are clear that respondent's practice infringed the second claim of the Jones patent in both letter and spirit."

If the contents of the mixer used by defendant were allowed habitually to become empty in carrying out its process, there would be no infringement; but all the evidence contradicts this. In the Jones practice this *cannot* be done, since the mixer cannot be tilted beyond a certain point. In the defendant's mixer it *can* be done, but *is not*, since the operator is not allowed to tilt it beyond a certain point gauged by a chalk mark. This seems to be the only foundation for the charge so frequently reiterated, and in varying language, that the methods in use before the Jones process deprived that process of all novelty, and if novelty existed it was by reason of the varying modes of executing such methods; the inference from this being that as the Jones method was old, it could only be treated as new because of the conduct of individuals in applying the method and their intentions, and that this reduces itself to the proposition that the Jones patent rests upon the

mere intention or minds of persons. If we understand this argument correctly, it is that the prior method contemplated storing only, and the mixing was but an incident, while the Jones patent contemplates mixing as its main object and storage only as an incident.

This proposition that the application of this patent depends upon the individual intent of the operator overlooks the essential nature of a process patent. The directions and specifications of such a patent are addressed to those engaged and skilled in the art. It professes to disclose a method of procedure, not the particular instrumentality that may be employed. It may be, as suggested, that one person may, and in ignorance of the patented method, make use of a reservoir *merely as such*, and without any desire to avail himself of the patented process; but such a fact would not deprive the discoverer of the process of the protection of his patent. Such a supposed case might present a question of fact for a court or jury, and if it were made to appear that the party charged with infringement had, as in this case, changed the instrumentalities used by him after a new method had been disclosed, and particularly if he had for the first time used a special device necessary to that process, a jury might well refuse to believe and find that the defendant was only following the old methods of procedure, and not seeking to avail himself of the plaintiff's invention.

But we think the difference in the two processes may be illustrated by a very simple example: Let us imagine a reservoir containing, say, three quarts, and filled with one quart each, of three liquids of different constituent parts, and withdrawn for further treatment at the rate of one or two quarts at a time. Necessarily there would be some incidental mix-

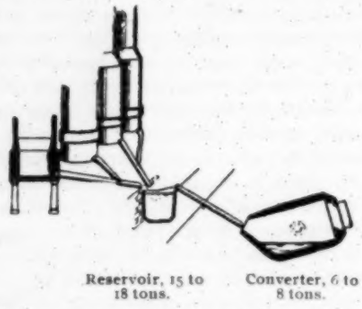

FIG. 1.—PENNSYLVANIA STEEL CO., 1881.

ing, but it would occur at once that the main object of the reservoir was a retention of a sufficient quantity of the mixture to supply the receptacle for further treatment, and if no necessity existed for a longer retention of the liquid in the reservoir, it could be very quickly emptied by two discharges into the receiving vessel. Now, let us substitute for this reservoir a cask of, say, 60 quarts, into which the liquids of different constituent parts are poured in at one end from a multitude of receptacles, and discharged at the other end after remaining a certain time in the cask, and that this cask could not be tilted so far but what a quantity of liquid would be left within it amounting, say, to half its capacity. Now, if there be no distinction between these two operations there would be little left to the Jones process, the very vitality of which consists in the size of the cask relative to the ladles and the mixing of the various liquids poured into it before they are withdrawn.

If, as insisted by the defendant and found by the Court of Appeals, the reservoir now used is the same in principle as the one which had been in use at the Cambria Iron Works ever since the Bessemer steel was first manufactured there, and the same were adequate for the purposes of the direct process, why was any change made? Therein we think the Court of Appeals made its most serious error. The defendant had an unquestioned right to manufacture steel, as it had been accustomed to do; but instead of that it abandons the Bessemer uncovered ladle of 12 to 18 tons, and adopts a covered refractory lined reservoir of 300 tons capacity, and makes use of it, not as before, for the storage of *cupola* metal, but for the mixing of *blast furnace* metal according to the direct process. This, too, was done immediately after Mr. Morgan's visit to plaintiff's works.

It is true that with the growth of the production of furnaces from 50 tons a day in 1872 to 400 or 500 tons in 1895 all apparatus would naturally be increased in size; but why was the open reservoir theretofore used for cupola metal provided with a cover and enlarged in its capacity from 15 to 300 tons—twentyfold, while the converter was little more than doubled in size? Why was it so operated that 175 tons were left in the mixer as a dominant pool, if no infringement were contemplated? In the face of these facts the question so earnestly pressed by the defendant, whether the "method of mixing molten metal," covered by the second claim, was one for securing a substantial homogeneous composition of metal, to the end of getting a practically uniform product, or was one simply for the purpose of preventing sudden variations in the compositions of successive small portions drawn from the reservoir, without attaining substantial uniformity, loses most of its significance. We do not know how the process can be better described than in the specification itself: "To provide means for rendering the product of steel works uniform in chemical composition." The variations in such composition are said to be "particularly in silicon and sulphur," and the process to be one of mixing, whereby the particles of metal "are diffused or commingled thoroughly among each other, and the entire charge is practically homogeneous in composition, representing in each part "an average of a variety of uniform constituent parts, all the charges of the converter from time to time will be substantially uniform." This, denuded of all hypercriticism, is the object of the Jones invention, which seems to be the only one yet devised for carrying on what is known as the direct process. If it be true that this process cannot be carried on without infringing the

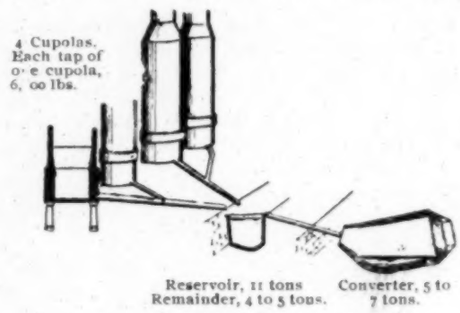

FIG. 2.—LACKAWANNA, 1869.

Jones patent, he is certainly entitled to a monopoly of the invention. If it can be, then every method theretofore known for carrying on such process was open to the defendant But we think the change from the Bessemer intermediate ladle to the Jones mixer was a radical one, and was made for a purpose. That purpose was clearly the adoption of the Jones process.

It is true that before the facts were fully ascertained, a stipulation was signed to the effect that the "amount of molten metal in said mixer (defendant's) varies from nothing to its full capacity, depending on the supply and demand the supply being generally sufficient to keep the mixer more than half full of molten metal, which metal remains molten therein." It appears, however, that upon the facts being more fully ascertained, notice was given that in so far as the stipulation varied from the facts appearing in the testimony of defendant's expert, it would be repudiated, and particularly that portion wherein it was said, "that the amount of the molten metal in the mixer varies *from nothing* to its full capacity." As it clearly appears from the mouths of defendant's own witnesses (notably Mr. Morgan) that, in the usual operation of the mixer, the ordinary amount of metal kept in the reservoir was more than one-half its capacity, we think that plaintiff's case should not be prejudiced by this stipulation. Stipulations are ordinarily entered into for the purpose of saving time, trouble or expense, and in this case it recites that "as defendant's counsel is expected to sail for Europe in a few days and may not be back for about four months, it is therefore stipulated by counsel for both parties, to save delay, as follows." But while the stipulation is undoubtedly admissible in evidence it ought not to be used as a pitfall, and where the facts subsequently developed show with

respect to a particular matter, that it was inadvertently signed, we think that upon giving notice in sufficient time to prevent prejudice to the opposite party, counsel may repudiate any fact inadvertently incorporated therein. This practice has been frequently upheld in this and other courts

In short, we are clearly of opinion that the reservoir now in use is used for entirely different purposes from the intermediate Bessemer ladle formerly employed; that the process carried on with it is identical with the Jones invention, and that its primary, if not its sole use, is for mixing purposes, with necessarily incidental storage, while the Bessemer intermediate ladle was solely used for storage, with little, if any, thought of the advantages to be gained by an incidental mixing.

Discarding now all that does not bear directly upon the validity of the Jones patent, and dropping all superfluity of words, let us determine exactly what Jones has contributed, if anything, to the art of making steel. He undoubtedly found reservoirs of small size in use in which were poured from receiving ladles enough molten metal to fill them, and from which a sufficient amount was discharged to supply a converter, usually about half the size of the reservoir. But in all these cases the fact whether any particular amount of metal was left in the reservoir was treated as a matter of indifference or accident, although there must have been necessarily some incidental mixing; and probably the metal as it ran into the converters approximated more nearly to uniformity than when it ran into the reservoir. The former methods were adequate for cupola metal, uniformity in which had been largely secured by a careful selection and breaking up of the pigs, but it had not proved a success for blast furnace metal, except that it had been used to a very limited extent in for-

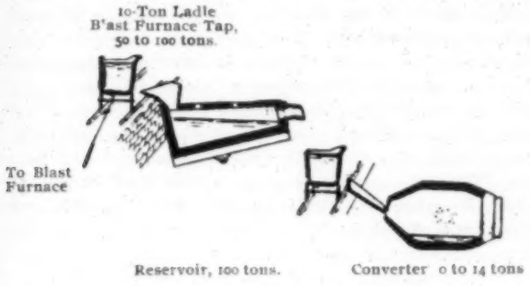

FIG. 3.—JONES MIXER, 1889.

eign countries where the peculiar character of the iron ore had rendered it possible to carry on a direct process, although apparently by methods quite other than those employed by Jones. The principal step employed by Jones was to magnify the capacity of the reservoir about twentyfold, provide it with a cover, and to arrange that it should not be tilted beyond a certain point, in order that a "considerable quantity" of molten metal might be retained in it for a sufficient time to accomplish a pretty thorough mixing, but little change having been made in the meantime in the size of the receiving ladles and converters. As the reservoir was designed to hold a large quantity of metal for a considerable time it must have been covered to obviate the contents being crusted over or sculled.

As soon as this method had proven to be successful by employment at the Edgar Thomson works, and had become so well known as to attract the attention of other manufacturers of steel, it found a ready sale, was adopted by all the leading manufacturers in this country, and was sold for use abroad for about $50,000.

It should be borne in mind that this process was one not accidentally discovered, but was the result of a long search for the very purpose. The surprise is that the manufacturers of steel, having felt the want for so many years, should never have discovered from the multiplicity of patents and of processes introduced into this suit, and well known to the manufacturers of steel, that it was but a step from what they already knew to that which they had spent years in endeavoring to find out. It only remains now for the wisdom which comes after the fact to teach us that Jones discovered nothing, invented nothing, accomplished nothing.

We cannot better conclude this opinion than by the following extract from the opinion of Mr. Justice Bradley in *Loom Co.* v. *Higgins* (105 U. S. 580, 591): "But it is plain from the evidence, and from the very fact that it was not sooner adopted and used, that it did not, for years, occur in this light to even the most skillful persons. It may have been under their very eyes, they may almost be said to have stumbled over it; but they certainly failed to see it, to estimate its value, and to bring it into notice. . . . Now that it has succeeded, it may seem very plain to any one that he could have done it as well. This is often the case with inventions of the greatest merit. It may be laid down as a general rule, though perhaps not an invariable one, that if a new combination and arrangement of known elements produce a new and beneficial result, never attained before, it is evidence of invention."

The decree of the Circuit Court of Appeals is therefore reversed and the case remanded to the Circuit Court for the Western District of Pennsylvania for further proceedings consistent with this opinion.

The Dissenting Opinion.

We have not space to go at length into the dissenting opinion of the four justices, but the following from its concluding pages will indicate how those dissenting were brought to a conclusion directly counter to the holding of the majority:

The construction now put upon the patent by the court disregards the provision that the variation which was to be cured was that existing between the "charges" as they were poured in, and assumes—contrary to the language of the patent—that the purpose was to cure variations which would exist in the mass of molten metal, when, by a sufficient charge, the reservoir had been filled. And this, although it is expressly declared in the patent that by the operation of the reservoir, in the mode described, the variations existing in

FIG. 4.—CAMBRIA MIXER, 1894.

the metal before the pouring in would be destroyed by the mixing, which would cause the mass from which withdrawals were to be made to become homogeneous.

The error becomes more manifest upon an examination of the last of the excerpted paragraphs, wherein is contained directions as to the withdrawals of the equalized metal from the sufficient charge, that is, the filled reservoir of equalized metal and the replenishing of the reservoir with new charges to make another sufficient charge. It will be seen that the patent contemplated the discharge of the mass of homogeneous metal by tilting the tank down to a residue, and that no reference is made to replenishing the reservoir until provision is made for the retention of a residue. Then the reservoir is to be replenished by the addition of new charges which mix with these parts of previous charges, which have been equalized and which remain in the reservoir as a residue. Obviously, in this subsequent addition of charges it was intended that a "sufficient charge" of metal should be contained in the reservoir, which, when thoroughly mixed, would form another homogeneous mass of molten metal, it being declared "by which means any sudden variations in the quality of the metal supplied to the converter is avoided." "By which means" is clearly meant the bringing into existence of the homogeneous mass referred to in the patent. In other words, the patent points out that by making all the "constituent charges" of a "sufficient charge" homogeneous there would be no variations in the withdrawals from that equalized mass. And this is besides made more manifest by the following sentence in which attention is called to the fact that the equalized metal thus drawn off might be carried to the converters or be cast into pigs without treatment in the converters.

Moreover, turning to the first paragraph in the excerpt, it

will be perceived that it is stated that the operation of the mixer as described will "secure, as much as possible, uniformity in the character of the metal which is fed to and discharged from the tank, (meaning the equalized mass) and cause the fluctuations in the quality of the *successive* tappings to be very gradual." That is to say, the patent contemplated that each distinct full reservoir or sufficient charge, constituting a batch of metal, would be homogeneous in itself and substantially uniform in its chemical constituents, and the *successive* "sufficient charges" or "full reservoirs" would, by means of the residuum, vary but slightly between each other. The words, "successive tappings" can have no other meaning than successive batches, for it is impossible to conceive that they could refer to the separate withdrawals of metal taken from one full reservoir or sufficient charge, because it had been declared that the "constituent charges" of each full reservoir of metal by the operation described would become homogeneous; that is, practically uniform.

Certainly, this construction of the patent gives effect to all of its provisions, and harmonizes with its plain letter, whilst the contrary construction, now approved by the court, reads out of the patent the repeated statements as to the purpose of the patent being to secure a uniform molten metal and disregards the fact that the patent expressly provides that what it aims to secure is such uniform metal as is fit not only for use in converters but for castings and any other mode by which such a metal can be utilized. Certainly, what has been previously stated is a demonstration that the construction previously given by me accords with the express declaration made by the patentee when he applied for his patent, and is strictly in harmony with the action of the Patent Office in allowing the patent. It is equally clear that the construction of the patent, which has been by me elucidated, is besides in accord with the conception entertained by the Patent Office of the meaning of the patent long after it had been issued. Thus, the Commissioner of Patents, in a report bearing date Jan. 1, 1896, reviewing the advance in the industrial arts, said (italics mine):

"A process now commonly used in steel manufacture is that of patent No. 404,114, Jan. 4, 1889, to Jones, in which he described a means of *getting a uniform product of metal* by mixing together in a suitable receptacle, *batches of metal* from different furnaces, so that the mixture when drawn off will be the average of the different charges."

As the views hereinbefore expressed sufficiently make manifest the reasons for my dissent, it is unnecessary to stop to notice many matters considered in the opinion of the court. Lest, however, if they are not referred to, it may be assumed that assent is given to them, the more important of such statements are briefly adverted to. First, it is said that the making of steel by the direct process was commercially impracticable before the grant of the Jones patent, and that that patent operated a revolution in the art. The proposition, in my opinion, finds no support in the record. On the contrary, it is affirmatively established that not only on the continent but in England and in this country, long prior to the grant of the Jones patent, Bessemer steel was made by the direct process, upon a large scale, continuously and successfully. So far as revolution in the art is concerned by the alleged enormous saving rendered possible by the use of the Jones method, it is not perceived how such a statement is compatible with the unquestioned proof in the record that, although the complainants at their Edgar Thomson works erected several of the Jones mixers about the time of the grant of the Jones patent, they did not introduce them into their other works until more than seven years afterwards. Indeed, to my mind it is established by the record that the Jones method, when put into practical operation by the complainant, proved not to be a commercial success, and the apparatus was continued in use despite this fact because of the means which it afforded of securing on a larger scale the benefits of storage hitherto well known in practice, and that the use of this larger storage vessel became more and more advantageous as the capacity of blast furnaces was enlarged and improvements took place in the mode of their operation.

The statement that upon the grant of the Jones patent the so-called mixer was at once adopted by steel works generally in this country is also unwarranted by the facts in evidence, which establish without any conflict that storage reservoirs of like capacity to that of the Jones apparatus were in use at the time of the hearing of this cause in but three steel works in the United States outside of those operated by the complainant, and that their introduction long after the grant of the Jones patent in such outside works is shown to have been coincident with the increase in blast furnace output and the necessity which had thus arisen for greater reservoir capacity to hold the enormous supply of molten metal which was then being produced by the operation of blast furnaces. The record, moreover, establishes that in the works in question, where long after the grant of the Jones patent large reservoirs were first employed, this was done not because better results were secured by means of mixing than had been obtained by the mixing theretofore resorted to, but because the larger output of blast furnaces pointed to the necessity for the construction of a larger reservoir than those previously employed.

The effect of the decision now rendered it seems to me is, therefore, to put the patentee in a position where, without invention on his part, and without the possession by him of lawful letters patent, he is allowed to exact tribute from the steel and iron-making industry, whenever those engaged in such industry desire to increase their plants or to more conveniently and satisfactorily conduct their operations so as to keep pace with the natural evolution of modern industrial development.

Clairton Steel Company.

The Crucible Steel Co. of America has decided to merge its two subsidiary companies known as the St. Clair Steel Co. and the St. Clair Furnace Co. under the name of the Clairton Steel Co. To complete the immense operations commenced by both companies it has also been decided to issue bonds to the amount of $5,000,000. Both subsidiary companies were organized last year and the furnace company has outstanding bonds to the amount of $3,000,000, 5 percent first mortgages, guaranteed, due in 1910 and 1939, and the steel company has an issue of $2,250,000 of a similar bond due in 1904 and 1925. The total bond issue of the St. Clair companies is now $10,250,000. The new issue increases the annual fixed charges by $250,000 and makes the total charges $5 2,500. The preferred dividends take $1,750,000 more. The net earnings of the Crucible at the end of last year were $3,521,209, and the surplus, after dividends on the preferred, was $1,730,958.

The official statement regarding the merger and the issue of bonds is as follows:

"The growing business of the Crucible Steel Co. of America, and the near completion of its new blast furnace plant and open-hearth steel plant, at Clairton, have rendered it necessary to make some important consolidations and changes, and it has been decided to organize a new company to be called the Clairton Steel Co., which will take over the St. Clair Steel Co. and the St. Clair Furnace Co. All the stock of this newly organized company—Clairton Steel Co.—will be owned by the Crucible Steel Co. of America. The Clairton Steel Co. has arranged with the Union Trust Co. for $5,000,000 to provide the money necessary to complete the furnace and steel plants, and to furnish ample working capital. The bonds for the above amount that will be issued will be guaranteed by the Crucible Steel Co. of America.

"It is expected that eight of the twelve 50-ton open-hearth furnaces will be in operation about the first of September, and the balance, together with the three blast furnaces, before the first of next year. With the completion of the above the Crucible Steel Co. of America will be able to supply from its own works all the pig iron and steel it will need for its various crucible plants. The executive and finance committees of the Crucible Steel Co. of America, and of the Clairton Steel Co., will be the same, and are composed of the following named gentlemen: C. H. Halcomb, W. P. Snyder, A. W. Mellon, Reuben Miller, James H. Park, Frank B. Smith and R. E. Jennings. C. H. Halcomb will continue as president of the Crucible Steel Co. of America, and W. P. Snyder will be president of the Clairton Steel Co."

The puddling department of the Wheeling Steel & Iron Co., Wheeling, W. Va., remains idle owing to the inability of the company to secure iron.

RECOVERY OF BY-PRODUCTS IN COKE-MAKING.*

BY J. THIRY, OF LONDON.

The importance in modern times of economizing in every branch of industry connected with the production of iron and steel has of late years led many inventors to bestow great attention on the manufacture of coke, and to endeavor by every available means to reduce the cost of production, profiting at the same time, wherever possible, by turning to account the valuable by-products carried off in the volatile constituents of the coal during the process of distillation. In this country too, where the use of coke from the beehive oven still continues much in favor, an increasing interest has lately been manifested in the new methods of coke production, and a number of plants have been erected which embody many of the most recent improvements. Nevertheless there still exists, in the minds of many, an invincible prejudice against the use of retort-oven coke in the blast furnace, and the adoption of the retort oven, whether with or without means for the recovery of by-products, proceeds but slowly, on account of the strong preference of so many ironmasters for the coke produced in beehive ovens.

Much credit is therefore due to Evence Coppée, to the late Henry Simon, and to J. Darby, the pioneers of the modern system in England, that they have succeeded, in spite of much opposition, in establishing, the former some 2,000 ordinary retort ovens, and the two latter together about 1,400 by-product ovens, in this country. Another firm, that of Dr. C. Otto & Co., have hitherto chiefly confined their practice to Germany, where no less than 14,000 ovens have been constructed on their system, besides which some 2,200 have been erected in the United States in accordance with their patents. It is only recently that they have attempted to introduce their system into this and other countries. A battery of fifty of these ovens has been in successful operation for about four years at the Newport Ironworks of Sir B. Samuelson & Co., Middlesbrough, and an additional battery of eighty was built during last year at the same works, and is expected to be at work within the next month. Altogether, some 200 examples of the Otto-Hilgenstock by-product oven will shortly be in operation in this country, and the construction of others in South Wales and Yorkshire is about to be proceeded with.

Through the inventions of the late Dr. C. Otto, and the subsequent improvements of Mr. G. Hilgenstock, the Otto-Hilgenstock oven has been so far perfected, that by its means a coke is produced which, both as regards quality and yield, is unsurpassed. The standard oven is 33 feet 7 inches long, 6 feet 6 inches to 6 feet 8 inches high, and 1 foot 9 inches wide in the middle. But notwithstanding its small capacity, the average output of such an oven is 31 to 32 tons of metallurgical coke per week. The general features of its construction are probably well known to most, but the accompanying drawing (see Fig. 1) will render the description more clear. The gases given off from the coal in the oven chamber A pass through the opening B into the gas main C on the top of the ovens, whence they are drawn into the gas coolers and other vessels by means of exhaust fans. After being freed from the by-products they are returned ready for use in heating up the flues of the ovens through the main pipe D, which supplies all the battery. From this main supply pipe D a number of smaller pipes E branch out into the arches which support the ovens, and from these again are led lateral branches which rise up to nozzles inserted in the heating flues F, which latter convey the necessary gas to each wall of the chambers. Bunsen burners are fitted to the nozzles, and by their action draw in sufficient air for combustion, which has previously become heated on its way through the arches to the heating flues. Thus in the simplest manner possible, and without providing any special apparatus for the purpose, the air for combustion is heated to a temperature of 400 degrees C. only by utilizing the heat from the foundations, an arrangement which confers the additional advantage of preventing these from becoming overheated. The gas and air ignite on meeting, and the flame rises vertically into the horizontal bottom flue and ascends through the vertical heating flues F to the horizontal top flue G. The direction of the flame throughout is the natural one, upwards, and there are no bends or angles to impede its course, necessitating a pressure or artificial draught. From the horizontal top flue the gases are led off into the center through the vertical flues H under the bottom I of the oven, this interception of the gases and their conduction below being necessary if their full heat is to be utilized. The products of combustion then pass from the bottom of the oven through the opening K, which is controlled by the damper L, to the main waste gas collector M, thence to the boilers, and are finally drawn off through the chimney. It will be seen that by this arrangement the Siemens regenerators for heating the air for combustion, which formed the distinctive characteristic of the Otto-Hoffmann by-product oven, are entirely dispensed with.

Comparing the working of the old method with the new, there was, on the one hand, the low value of the waste heat for the generation of steam and the intermittent supply of heat to the oven due to heating the sides of the chamber alternately, which involved the necessity of providing two main waste gas flues and very long gas passages. On the other hand, in the new system there was obtainable an increased yield in coke and by-products without special provision for pre-heating the air for combustion. It was mainly these considerations which induced the Otto company to abandon altogether the Otto-Hoffmann in favor of the Otto-Hilgenstock oven, although the former for more than twelve years, from 1882 to 1894, had been regarded in Germany as the leading type for the recovery of by-products.

The chief improvements consist, first, in the use of Bunsen burners. By this means perfect combustion of the gases is obtained, and the even distribution of the burners along the whole length of the oven ensures a uniform heat in all parts. At the same time a very high temperature is attained, upon which circumstance the quality of the coke so much depends. Secondly, the heating gases have only a very short distance to travel, and this in the upward and natural direction; therefore the draught required is very little, and, as an oven wall is never gas proof, the losses arising from leakage of gas from the oven chamber to the flues, or vice versa, are reduced to a minimum. Further, if, as sometimes occurs, the gas pressure weakens from any cause, the flow through the flues is apt to become irregular or to stagnate entirely in those farthest removed from the point of admission. This defect is especially troublesome in ovens with long horizontal flues, and leads to the irregular heating of the coke chamber, which in turn causes a deterioration in the quality of the coke and increases the time of coking. The arrangement, however, of conveying the heating gas from the lower to the upper horizontal flue through short vertical flues permits the most complete supervision and control of the flow of gas in every part of the flues. Owing also to the high temperature, the coking time is shortened, and therefore an increased production per oven per week is obtained, and the cost of labor is of course correspondingly reduced.

Analyses show that the gases generated in these ovens are very pure, and contain not more than 5 percent of nitrogen whereas in other ovens where a stronger draught is required the proportion of nitrogen rises to 10 or 12 percent. The value of the gas, both as an illuminant and as a heating agent, is therefore enhanced, and experiments also show that the resulting tar is richer in valuable by-products; consequently the output of benzol and its kindred compounds is increased.

By paying the most careful attention to the working out of the details of the design, the efficiency of the oven has been increased until the yield in coke is some 5 percent more than the crucible yield, a circumstance which is principally due to the small chimney draught required for working the ovens.

The author regrets that he is unable to furnish data regarding the cost of production in England, as he has hitherto had no opportunity personally of working an installation in this country; but from all information which he has been able to gather from ironmasters who own these ovens, he is in a position to assert that the cost of labor is no higher than that for working the beehive ovens. With the exercise of due care in the management of a plant the repairs are insignificant, and the life of an oven may be safely put at ten to twelve years before any heavy repairs are needed. There are many

*Read at the meeting of the Iron and Steel Institute, London, Eng., May 8, 1902.

instances in Germany of batteries which have been working uninterruptedly since 1896, the only repairs necessary having been occasioned by carelessness in quenching the coke, by which the hot brickwork was damaged. An increase in stability and durability is imparted to the structure by reducing the height. This is about 6 feet, but larger ovens have been built in this country, though at a sacrifice of the full period of the oven's life.

By the kindness of Sir B. Samuelson & Co. the author has, however, been permitted to carry out some tests with regard to temperature, draught, and duration of the coking process, of which the following is a summary of the results:

(a) Combustion Flue.—Measurements taken at different ovens gave a temperature of 1378° C. (2510° F.), 1389° C. (2534° F.), 1408° C., 1396° (2220° F.), C., and 1462° C. (2664° F.) respectively.

The pressure of the draught below that of the atmosphere was equivalent to a water-pressure of 1.52, 1.89, 2.39, 1.96, and 1.16 millimeters respectively.

(b) Lower Horizontal Flue.—The temperatures were 1227° C. (2243° F.), 1254° C. (2285° F.), 1312° C. (2395° F.), and 1215° C. (2200° F.), and the pressure of the draught was equivalent to a water-pressure of 1.79, 1.53, and 2.10 millimeters below atmospheric pressure.

(c) Upper Horizontal Flue.—The temperatures measured at different ovens were: 1116° C. (2136° F.), 1142° C. (2085° F.), 1250° C. (2282° F.), 1145° C. (2092° F.), 1190° C. (2174° F.), 1184° C. (2160° F.), 1278° C. (2335° F.), and 1144° C. (2090° F.).

The pressure of the draught measured at different ovens was equivalent to a water-pressure of 1.52, 1.89, 2.39, 1.96, and 1.52 millimeters below the atmospheric pressure

(d) Gas Main.—At the top of the oven and at the point of entry into the exhaust pipe the pressure was equal to a water-pressure of 0.44 millimeters below atmospheric pressure, and the temperature in the main was 283° to 293° C. (544° to 560° F.).

(e) Waste Gas Flue.—In front of the ovens the pressure was equal to a water-pressure of 6.89 millimeters, which increased to 10.30 millimeters before entering the boilers, the temperature being 1245° C. (2273° F.).

(f) Air for Combustion.—The temperature at the top of the gas burners varied between 355° C. (671° F.) and 438° C. (820° F.).

The slight differences in the temperature and draught were due to the lack of proper regulation by the oven damper L.

Looking back to the performances of the earliest types of by-product ovens, and by referring to the numerous communications made to this Institute in 1883, 1884 and 1885 concerning these, some idea will be gained of the immense progress made since those days. The production of coke in 1883 was about 1.2 to 1.5 ton per twenty-four hours per oven, while with the present oven of the Otto-Hilgenstock type it amounts to 4.5 tons per oven in the same time, the capacity of the oven being practically just the same. For this remarkably increased efficiency the improved method of firing is chiefly responsible, since the rapid production of coke depends on the supply of heat available.

Soon after the introduction of by-product coke, complaints as to its quality became very numerous; but when regard is had to the great improvements in coke-oven construction since those days, it appears to the author that the prejudice against retort-oven coke is no longer reasonable, especially as in all other iron-producing countries—the United States, Germany, France, and Belgium—the modern methods of producing coke have long since been universally adopted. It has, moreover, been substantiated by numerous tests with the coke made in the Otto-Hilgenstock ovens at Middlesbrough that the loss on ignition in the crucible test is only 0.5 to 0.6 percent—that is to say, it is quite equal to coke made in the beehive oven. It is also a noteworthy fact that since the introduction of the principle of heating from the bottom by Mr. Hilgenstock, by which the gas passages are so conveniently shortened, all other constructors of coke ovens have endeavored as far as possible to imitate him by adopting the same principle. When all the various advantages of the modern system of ovens are fairly considered, and taking into account besides that the yield of such an oven is 15 to 20 percent higher than with the beehive oven, it must be apparent that there is some justification for incurring the greater expense

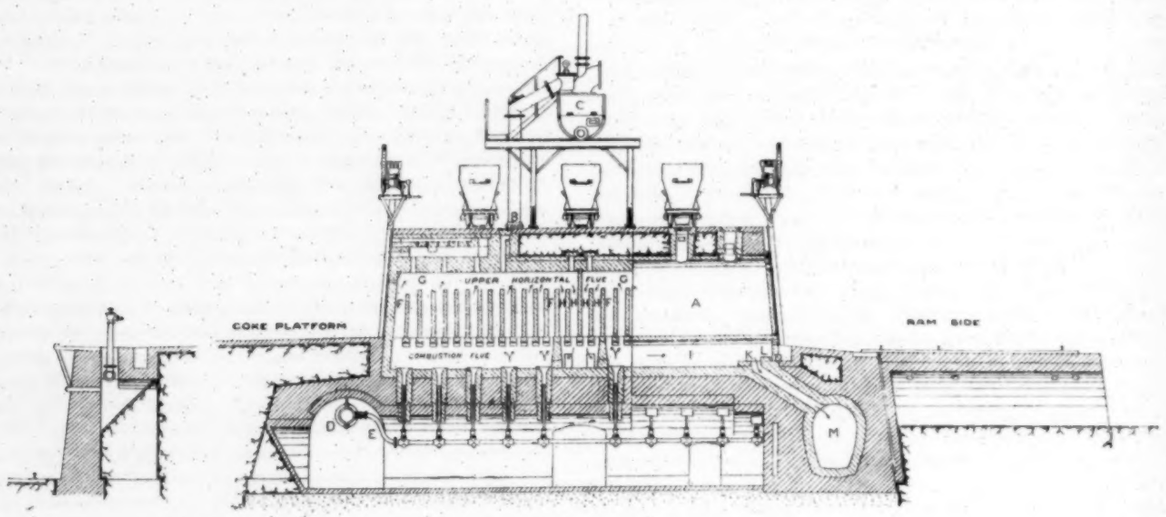

FIG. 1.—THE OTTO-HILGENSTOCK COKE OVEN.

required for the establishment of a by-product plant, especially as the demand for the by-products themselves is very considerable, and continues to be so in spite of the greatly increased production of the chief constituent, sulphate of ammonia. It has indeed of late been urged as an objection to the adoption of by-product coke ovens, that if such plants continued to be built in increasing numbers the production of sulphate of ammonia would correspondingly increase until the supply far exceeded the demand, thus rendering it difficult to find a market for the excess product. A general fall in price might then be anticipated, which would cut down any margin of profit, and makers of coke would then find themselves with an expensive plant left on their hands which could only be worked at a loss. With the object of ascertaining to what extent such apprehensions were justified, and being desirous of placing the true facts before the ironmakers, the writer caused inquiries to be made, and eventually elicited from the German Association for the sale of sulphate of ammonia an expression of opinion as to the future prospects of the sulphate of ammonia industry, which may be regarded as quite trustworthy. According to this authority, the best evidence of the maintenance of prices in the future is afforded by a study of the published returns relating to the manufacture of sulphate of ammonia since 1895, and a comparison of the fluctuations in price corresponding to the state of the market for the same period. In the light of these facts it will no doubt be possible to refute, and in fact to dispel entirely, the groundless apprehensions entertained by those who

are interested in this question. In Westphalia the production of sulphate of ammonia in 1895 was 10,043 tons, and it rose in the following year to 21,377 tons, with an average price of £7, 18s. per ton. In 1897 the production was 32,418 tons, of the value of £7, 13s. per ton. Throughout the succeeding years it continued to increase until, in 1900, it amounted to 49,223 tons, the price also gradually advancing until it reached £10, 6s. per ton. Prior to the year 1895 the individual manufacturers sold their product independently, which renders it difficult to estimate the average value before that date. It may, however, be assumed that it fluctuated between £9, 16s. and £10, 6s.

The total production in the year 1898 may be apportioned among the chief iron-producing countries as follows:

Great Britain	about	215,000 tons.*
Germany	"	100,000 "
France	"	30,000 "
Belgium	"	30,000 "
Other countries	"	65,000 "
Total		440,000 "

In 1901 the world's production is estimated as amounting to:

	Tons.
Great Britain	220,000
Germany	130,000
France	38,000
Belgium	75,000
Austria, Russia, Spain	40,000
United States	60,000
Total	523,000

On comparing the selling price of sulphate of ammonia for the years above mentioned with the quotations for Chili nitrates, it will be found that the former follows to a certain extent those of the latter, but the difference in the nitrogen contents of each—21.2 percent for sulphate of ammonia and 16.4 percent for Chili nitrates—must be taken into account.

*Which figure, however, is probably too high.

When it is further considered that about 1,300,000 tons of Chili nitrates are yearly produced and used, and, moreover, that sulphate of ammonia is a particularly suitable substitute for Chili nitrates as a fertilizer, for which purpose the latter is principally used, it is abundantly clear that only when the price of Chili nitrates is depressed will it be possible for a continuous backward tendency in the price of sulphate of ammonia to occur. The prices of Chili nitrates have, however, as a matter of fact materially increased of late, and even if they decline they can only fall in the most extreme case to a level of £7 per ton, below which figure the production and preparation of nitrates would cease to be profitable. This would, however, be equivalent to a price of £9, 5s. per ton for sulphate of ammonia; on taking into account the superior nitrogen contents of the latter. Further, it is possible that the nitrate fields will, according to the present available estimates, be completely exhausted in twenty-three years, provided the yearly production continues at the same level as in recent years, namely 1,300,000 to 1,400,000 tons. Probably, therefore, the great need for nitrogen as a fertilizer will no longer be sufficiently met as at present by the use of nitrates, and it will become imperative to increase very largely the production of nitrogen—that is to say, ammonia—for the purpose of satisfying the demand.

At the present time in Germany nearly 160,000 tons of sulphate of ammonia are used annually for agricultural purposes. In addition to this, the imports of nitrates in 1900 amounted to 484,543 tons, and in 1901 to 529,568, which in regard to nitrogen are equivalent to 363,300 tons and 397,200 tons of sulphate of ammonia respectively. In order to ascertain the suitability of coals from various districts for treatment in by-product coke-ovens, a number of analyses of coals from different British coalfields have been made, and the results are given in the appendix. It is to be hoped that these figures will suffice to remove all doubts concerning by-product ovens as a future source of profit and economy, and that the most skeptical opponents of the system will be convinced that their apprehensions with regard to large modern installations with recovery plants attached are groundless.

APPENDIX — ANALYSES OF COAL.

Coalfield.	Yield of Coke. By Crucible Test.	Yield of Coke. In Otto By-Product Oven.	Gas from One Ton of Dry Coal at 15° C. in Cubic Metres, incl. CO_2, SH_2, C_6, H_6.	Volatile Matter.	Ammonia.	Ammoniacal Liquor.	Sulphate of Ammonia.	Tar.	Carbonic (CO_2) Anhydride.	Sulphuretted Hydrogen (H_2S).	Benzol.	Ash.	Moisture.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Derbyshire	65·27	71·67	277·3	28·33	0·434	8·62	1·685	2·85	3·99	0·09	0·63	16·05	0·75
"	70·28	75·48	274·6	24·52	0·397	7·36	1·540	2·45	3·54	0·11	0·91	12·27	0·40
Durham	68·36	75·21	324·7	24·79	0·319	4·69	1·240	3·56	1·00	0·44	1·42	8·22	0·44
"	67·25	75·06	324·6	24·94	0·357	4·90	1·385	4·39	1·51	0·51	1·43	4·94	0·13
"	67·84	76·05	302·1	23·95	0·373	5·39	1·448	3·01	1·66	0·20	1·44	2·78	0·13
"	69·13	75·25	307·9	24·75	0·353	5·43	1·373	4·45	1·12	0·37	1·30	5·45	0·15
"	71·45	77·43	306·5	22·57	0·350	4·39	1·360	4·13	0·92	0·33	1·33	6·58	0·10
Glamorgan	77·95	83·61	279·8	16·39	0·287	2·60	1·114	2·17	0·68	0·09	1·04	1·87	0·27
"	74·05	80·13	288·5	19·87	0·326	4·78	1·268	2·40	0·99	0·17	1·43	1·62	0·40
"	81·72	85·00	264·5	15·00	0·298	3·44	1·157	2·40	0·47	0·20	0·88	12·22	0·28
"	74·90	80·75	305·4	19·25	0·286	3·91	1·113	3·13	0·80	0·08	1·18	2·14	0·30
"	77·95	82·76	281·0	17·24	0·294	3·93	1·144	2·39	1·17	0·22	0·93	13·07	0·47
Lancashire (W.)	60·95	70·40	352·0	29·60	0·513	8·02	1·993	3·16	2·87	0·50	1·57	5·86	0·21
"	63·57	71·90	323·0	28·10	0·466	5·98	1·808	2·70	3·36	0·39	1·35	8·60	0·40
Monmouthshire	81·97	85·84	253·0	14·16	0·278	2·91	1·078	1·75	0·63	0·12	0·67	5·96	0·39
"	80·91	84·92	...	15·08	0·288	3·30	1·043	1·76	0·76	0·21	0·85	5·50	0·63
"	75·52	80·18	305·7	19·82	0·260	5·67	1·008	2·68	1·07	0·17	0·91	7·43	0·07
"	75·57	80·83	295·9	19·17	0·247	5·97	0·960	2·97	0·86	0·17	0·97	7·55	0·09
"	75·10	80·97	300·6	19·03	0·297	6·17	1·153	2·75	0·99	0·17	0·85	8·50	0·15
"	70·90	77·73	270·0	22·23	0·300	5·12	1·166	2·92	2·21	0·23	1·08	20·23	0·14
"	72·00	78·26	280·3	21·74	0·294	5·85	1·144	2·25	2·11	0·19	1·17	20·28	0·20
Somersetshire	72·80	79·92	307·3	20·08	0·343	4·58	1·334	2·31	1·21	0·16	1·01	5·05	0·35
Stirlingshire	63·69	71·18	323·9	28·82	0·443	9·11	1·720	3·62	2·25	0·36	1·32	7·45	0·82
Warwickshire	58·08	65·96	288·7	34·04	0·456	12·75	1·813	2·99	4·31	0·28	1·13	6·62	2·38
Yorkshire	63·72	69·71	306·3	30·29	0·355	11·82	1·375	3·35	2·19	0·24	2·32	6·52	4·69
"	67·95	75·21	300·6	24·79	0·383	5·73	1·483	3·73	2·05	0·44	1·57	11·47	0·59
"	65·80	73·08	320·6	26·92	0·414	6·57	1·572	3·71	2·75	0·15	1·60	6·77	0·90
"	68·97	75·17	281·3	24·83	0·372	6·63	1·444	3·49	1·62	0·51	1·22	19·34	0·81
"	68·13	74·29	274·1	25·71	0·344	7·39	1·337	3·99	1·49	0·43	1·29	10·59	0·67
"	64·98	73·70	317·7	26·30	0·380	5·98	1·478	4·49	1·21	0·53	1·50	7·79	0·28
"	68·54	75·59	309·6	24·41	0·373	6·79	1·448	2·71	1·05	0·62	1·46	12·38	0·27

The Republic Iron & Steel Co. has purchased considerable property at Haselton, near Youngstown, O., upon which not only a blast furnace will be erected, but a structural mill as well. The blast furnace is made necessary by the recent additions to the capacity of the Bessemer plant, while a structural mill will be erected owing to the heavy demand at present for all kinds of structural material, the output of the mills of the country being too small to supply the demand. It is also probable that a structural fitting shop will be erected.

C. A. Stevenson & Co., St. Louis, Mo., pig iron dealers, have opened an office at 1209 Fisher Bldg., Chicago, which is in charge of A. B. Stevenson.

PRODUCTION OF TUNGSTEN AND MOLYDENUM.

Some of the rarer metals that have in recent years been alloyed with steel have attention in the "Mineral Resources of the United States, 1901," now in press, published by the United States Geological Survey, David T. Day, chief of division. Dr. Joseph Hyde Pratt, writing in this volume on tungsten, molybdenum, uranium, and vanadium, says:

"The metals tungsten, molybdenum, uranium, and vanadium are still attracting much interest in the steel industry, because of the beneficial properties which they impart to steel, although the alloys ferro-uranium and ferro-vanadium are still in the experimental stage as to their actual commercial value; the ferro-alloys of molybdenum and tungsten have passed this stage. The demand for tungsten has not increased during 1901, but molybdenum has been greatly in demand, and its market value has remained nearly constant.

Tungsten.

"The sources of tungsten are the three minerals scheelite, wolframite, and hubnerite, and of these scheelite, a tungstate of calcium, is the one that can be used in producing the metal, or ferro-alloy. Thus far scheelite has been found in only one locality in the United States in sufficient quantity. Wolframite and hubnerite occur abundantly, and the sources of supply greatly exceed the demand.

"For a number of years practically all the tungsten used in the United States was imported from England, Austria, Hungary, Saxony, Germany, and Australia. The principal deposits in this country have been found in Arizona, Nevada and Colorado. Deposits have also been found in Oregon, Washington, Idaho, Montana, New Mexico, South Dakota, Connecticut, and North Carolina. The Arizona deposits are in the Arivaca district, Pima county; in the Dragoon Mountains, Cochise county, and 60 miles south of Hackberry, Mohave county. The Nevada deposits are near the base of Wheeler Peak, in the South Mountains, about 12 miles south of Osceola, White Pine county. The Colorado ores have been found in quantity in San Juan, Boulder, Gilpin, Ouray, and Lake counties, the principal mines worked in 1901 being those in Boulder county, where the Great Western Exploration & Reduction Co. has been recently organized both to mine and reduce the ores and to manufacture ferro-tungsten alloy. The massive scheelite deposit in the Cliff mine in the Virtue district, east of Baker City, Oregon, carries considerable free gold. There has been a little tungsten mining at the Harrison and the Durango mines in the North Lead district of South Dakota; and also at the scheelite mines of the American Tungsten Milling & Co., near Long Hill, Fairfield county, Conn.

"Tungsten has been used for making colored cotton goods 'fast' or washable, for rendering clothes non-inflammable, for the manufacture of stained papers, for coloring glass; as an alloy with copper and aluminum for the manufacture of propeller blades; as calcium tungstate in Roentgen ray apparatus. Now the chief use, either as ferro-tungsten or as the powdered metal, is in making tungsten steel. The production of tungsten ores during 1901 amounted to 179 tons, concentrated from 1,221 short tons of crude ore, valued at $27,720, at an average price of $154.86 per ton. The price of tungsten ores has decreased from 50 to 75 percent during the last two years.

Molybdenum.

"Molybdenum, found as the minerals molybdenite and wulfenite, generally occurs in beds, or is disseminated through crystalline rocks, granite, gneiss, syenite, and granular limestone. It has been found abundantly in many localities, as in California, in Mono county twelve miles northwest of Bridgeport, on the west fork of Walker River, where the molybdenite core is about 20 feet in diameter; on Alamo Mountain, in northeastern Ventura county, where the vein is said to be from 8 to 15 feet wide. In Washington, molybdenite deposits are worked by the Crown Point Mining Co., of Seattle, on Railroad Creek in the Stehekin mining district, in western Chelan county. This deposit is associated with gold, silver, and copper ores, and is in quantity. In Montana, at the Leslie copper mine, in Missoula county, molybdenite was found in quantity in the upper parts of the mine. In Utah, molybdenite deposits have been discovered near Leamington, Millard county, but not sufficient development work has yet been done to determine their extent. In Arizona a vein of molybdenite 5 feet wide is reported in the Santa Rita Mountain district, Pima county. In New Mexico, molybdenite is reported in quantity about 25 miles from East Las Vegas, San Miguel county. It is also reported in quantity near Portage, Aitkin county, Minnesota, and near Cripple Creek, Colo. A deposit of molybdenite of good indications has been developed near Skagway, Alaska.

"The chief uses of molybdenum until recently have been in determining phosphoric acid by ammonium molybdate, and in preparing 'blue carmine' for coloring porcelain. The ferro-alloy of molybdenum is now used in making a special steel, to which it gives valuable properties. The production of molybdenite in the United States in 1901 has probably not been over 10 or 15 tons, which does not supply the demand. The ore, to be marketable, must contain over 45 percent of molybdenum and be free from copper. The average price of a 50 to 55 percent ore is probably about $400 a ton. The increase in the domestic production of 1902 over 1901 should be large.

Uranium and Vanadium.

"During the last few years there has been some demand for these metals for experimental work as to their beneficial effect upon steel. Uranium is found in the forms uraninite, gummite, and carnotite. The principal occurrences of uraninite are at the Wood, the Black Hawk, and the Kirk mines near Central City, Gilpin county, and on Dolores River at the mouth of Disappointment Creek, Montezuma county, Colo. It has also been found on the eastern slopes of Paradox Valley, Montrose county, Colo. It has been found in doubtful quantity in the Ross Hannibal mine in the Ruby basin of the Black Hills, South Dakota; in the President mine, near Elizabethtown, Colfax county, New Mexico; and, with gummite also, in some of the pegmatitic dikes of Mitchell county, N. C.

"Carnotite, which contains the oxides of both uranium and vanadium, occurs at La Salle Creek, 6 miles from Cashin, Montrose county, Colorado; and it is reported from the western slopes of the La Salle Mountains in southeastern Utah.

"The other principal source of vanadium is canaiinite, which has been found in some quantity at the Vulture and the Phoenix mines in Maricopa county, and at the Mammoth mine, near Oracle, Pinal county, Arizona; and at Lake Valley, Sierra county, and at the Mimbres mines, near Georgetown Grant county, New Mexico. Vanadium has been obtained from certain slags at Creusot, France; and it has also been found in the ash of certain coals—a source that is attracting the interest of manufacturers and chemists.

"Both uranium and vanadium as ferro-alloys increase to a remarkable degree the tensile strength and toughness of steel, though no commercial steel seems thus far to have been made with them.* Uranium compounds are used in manufacturing and decorating porcelain and glass, and canadium is used for vanadium bronze in the place of gold bronze. The production of uranium and vanadium minerals during 1901, confined for the most part to Colorado, amounted to about 375 short tons of the crude ore. The highest recorded price for the crude ore was $150 per ton; uranium oxide has been sold as nigh as $1.20 per pound."

To Remove from Connellsville, Pa.

We are officially advised that the plant of the Steel & Iron Aluminum Coating Co., the proposed plant of the Rolling Mill Co. of America and the automobile plant all interests of George J. Humbert, at South Connellsville, Pa., will be removed to Morgantown, W. Va., at an early date. Lack of local support is assigned as the principal cause of the removal of the plants. The Morgantown syndicate that negotiated for the removal of the plants agrees to reimburse the rolling mill company for all money spent thus far in the erection of the plant at South Connellsville and will pay all the expenses of the removal of the plant of the Steel & Iron Aluminum Coating Co., in addition to furnishing a free site and building for the same. Surveyors are already at work at Morgantown laying out the site for the plant of the Rolling Mill Co. of America.

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*This statement requires some qualification. A French special steel, in which is a certain pe centage of ferro-vanadium, has been marketed in the United States in the past year.—Ed.

A NEW SYSTEM OF COOLING TUYERES FOR BLAST FURNACES.*

BY HORACE ALLEN, OF LONDON, ENG.

With the process of smelting iron in blast furnaces has unfortunately always been associated the difficulty of protecting efficiently and economically the end of the air-blast pipes from being damaged by the high temperature in their immediate proximity, due to the rapid combustion of the fuel. The higher the pressure of the blast, the more intense is the combustion. This difficulty was increased by the introduction of the air-blast at higher pressures than were used in the earlier days of iron smelting, and further by the raising of the temperature of the ingoing air up to the degrees of heat now attainable by the employment of firebrick hot-blast stoves of Cowper, and others of similar character. For many reasons, water has been found to be the most efficient and convenient agent for preserving the end of the blastpipe from injury through heat influences; the water being introduced through a protecting nozzle, or tuyere, in such a way, and in such quantity, as to keep the end of the blastpipe below the degree of temperature that would otherwise damage it.

Though no doubt considerable study has been expended on the question of the best form of tuyere to be adopted, so far only a few varieties are found in common use, the general principle of their construction being a hollow cylindrical nozzle, or tuyere, through which water is passed in sufficient volume to reduce the temperature in the immediate proximity of the blastpipe below the softening point of cast iron.

Thermal Loss Due to Cooling Water.

At this stage it is well to remember that the application of water to cool the end of the blastpipe is a source of thermal loss, for as the water flows through the tuyere and becomes heated, the equivalent amount of heat is extracted from that derived from the combustion of the fuel; and as this gain of heat of the water is not turned to any useful account, it becomes a loss factor in the economy of the blast furnace. In this connection it may be pointed out that the adoption of the system of water cooling plates, etc., so largely applied to the modern blast furnace, while it helps to keep the lines of the furnace very nearly normal, is also accompanied by a direct loss of heat efficiency. This point is worthy of more careful study in regard to the latest designs of furnaces.

In the application of water for tuyere-cooling purposes, it has been found from experience that the volume required is considerable, and to provide this volume, as a constant supply, has necessitated a system of storage with a certain head, or pressure. The pressure above that of the atmosphere, at which the tuyere water supply is usually supplied, varies in different localities from 10 pounds per square inch to 30 pounds per square inch. This pressure leads to a further complication, for, though it is useful in insuring the delivery of the required quantity of water to the tuyeres, it is found that should any damage happen to cause a puncture in the tuyere, the high pressure of the water supply causes the water to escape into the furnace, and come in contact with the highly heated materials in proximity to the tuyere.

To refer back somewhat, for the sake of preserving the interior lines of the furnace as far as possible, it is usual to cause the tuyeres to project a few inches past the hearth wall into the interior, where they are in direct contact with the highly heated iron and slag as they descend into the hearth, to say nothing of the eroding action of the coke, etc., in their neighborhood.

Pressure of Air-Blast in the Interior.

In furnaces which the author has examined with a blast pressure at the engine of 4½ pounds, the pressure at the tuyere testing hole was about 3 pounds, while inside the furnace the pressure was only about 1½ pounds, and with the higher pressures now adopted there will probably still be a reduction of about 1½ pounds between the pressure at the blastpipe and inside the furnace crucible. Probably no English furnace has up to the present a higher pressure of blast at the blastpipe than 9 pounds, and this would be reduced at least 1½ pounds, leaving 7½ pounds, which is equal to a head of water of 17 feet, so if the tuyere water supply exceeds a pressure of 7½ pounds per square inch, any defective tuyere will allow of water passing into the furnace crucible, even when the blast is full on.

The effects upon the furnace working of water leaking into the crucible are well known. While all reference to the leakage of water into the furnace hearth applies equally to both tuyeres and coolers, the latter are, however, seldom found to leak, so the new system under consideration will only be described as applied to the tuyeres.

Description of the New System.

In the new system, invented by Mr. W. J. Foster, of cooling blast furnace tuyeres in such a manner as to prevent the leakage of water into the furnace crucible, the water is not applied under pressure, but is aspired through the tuyere by suction. It will be evident in this case that, should any tuyere become damaged through the intense heat, erosion, faulty coil pipes, or impure or hard water, no water can escape into the furnace. Very little alteration to the usual pipe fitting is required to enable the new system to be applied to any furnace, the chief desideratum being a reliable pump, preferably of sufficient size to permit of a low piston speed of about 100 feet per minute, and capable of continuous running. Where a sufficient fall is available the addition of a syphon pipe will greatly reduce the wear and tear on the pump as well as relieve the furnace from being dependent upon the pump. The pump is then only necessary for starting the syphon and restoring the vacuum.

With this system, when a tuyere happens to become damaged and leaks, instead of water entering the furnace, air tends to enter the tuyere and destroy the vacuum, and solid particles, molten iron and slag, usually close up the hole almost immediately, though a hole ¼-inch or ⅜-inch diameter will not cause the water to stop flowing entirely. By means of three sluice valves arranged near the pump, as shown on the illustration, the syphon may be put into action, and the pump cut out by stopping it, opening the bypass, and closing the inlet and delivery of the pump. With this arrangement of pump and syphon, to or three furnaces can be successfully worked, as the water supply would not be dependent upon the continuous action of the pump, which any slight packing or repair might render necessary to stop for a short time.

To allow a sufficient volume of water to pass through the tuyere coil under the reduced pressure the diameter of the pipe employed should be increased from 1 inch to 1¼ inches, in which case a moderate vacuum will readily pass 1,200 gallons of water per hour through each tuyere, with an increase of temperature under normal conditions of about 15 or 16 degrees F. The piping employed for the tuyere coils should be of best quality, as any film of air enclosed in blisters prevents the water from acting on the outer surface at that point, so permitting the pipe to burn.

Under the pressure system the number of tuyeres lost varies very considerably owing to many causes, being sometimes as low as 36 tuyeres per furnace per annum, on a furnace with 8 tuyeres, and at other times the loss suddenly rushes up to 12 tuyeres per week. An important advantage of the vacuum system over the pressure system is that a tuyere is much more readily changed, owing to its being free from accumulation of material on the end projecting into the furnace through water leakage; the tuyere can always be changed in a good fire in five minutes. In one instance a tuyere was changed in four and a half minutes.

Method of Indicating Defective Tuyeres.

When the cooling water is supplied to tuyeres under a considerable head it is no easy matter to detect a leaky tuyere, unless the leak is of considerable proportion; the result being that a tuyere may sweat, or slightly leak, for a considerable period before it is discovered. With the suction method of drawing the water through the tuyere, besides the impossibility of water entering the furnace through a leak, the effect of a leak in the tuyere coil is to reduce, or destroy, the vacuum, but by means of an automatic gauge fitted with electrical attachments it is possible to indicate at any convenient point that a leak has occurred, as well as to show which tuyere it is that has become defective. The indicator, invented by Mr. B. H. Thwaite, consists of a tube containing mercury so placed that when the vacuum in the pipe

*Read before the Iron and Steel Institute at London, May 8, 1902.

leading from the tuyere is reduced, the mercury in the gauge tube makes contact and closes an electric circuit, ringing an alarm bell, and indicating, by a number on a register the particular tuyere that requires attention.

To give an instance of the difference between the two systems: a tuyere working under the usual conditions of water cooling under pressure was found to be leaking. Instead of changing the tuyere the pipes were connected so that the cooling water was drawn through by suction, with the result that the tuyere worked satisfactorily for six days. The tuyere was then taken out for examination, and it was found that the original hole through which water had been leaking, when under pressure, had become covered with slag and graphite, thus prolonging the life of the tuyere very considerably when working on the new system. Although when under pressure this tuyere had permitted a lot of water to enter into the furnace, causing the quality of the iron to fall to "forge," ordinary examination failed to detect the leakage.

At a meeting of several thousand machinists held at Pittsburg on Saturday evening, May 17, it was almost unanimously decided to ask for an advance in wages from 30 to 40 cents an hour. This increase is asked for all the machinists in the plants in Pittsburg and the immediate vicinity. No date has yet been decided for the new order, a committee having been appointed to work out the details. The machinists are sanguine of success and believe that their demands will be acceded to without a struggle. The enforcement of the nine-hour day on Tuesday, May 20, in some cities did not affect any of the shops in Pittsburg or vicinity.

LITTLE'S UNIVERSAL DRAFTING MACHINE.

It is one of the peculiar inconsistencies of the trade that the branch of the mechanic arts which more than any other perhaps is constantly engaged in the production of new designs, improved tools and equipment, retains with but few changes the instruments in vogue many years ago. It would not be fair to suppose that the manipulators of drafting tools are themselves indifferent to the benefits derived from mechanical improvements in their work or that the tools are incapable of greater usefulness with the expenditure of a certain amount of inventive skill by a workman well versed in the needs of his business. Such inventions would naturally be expected from the men engaged in the work of designing machinery, for example, and to one of these, who has had considerable experience in structural work also, the improvement here illustrated is due. Chas. H. Little in his work with the Wellman-Seaver-Morgan Engineering Co., of Cleveland, had frequent occasion to make working drawings requiring the continuous handling of T-square, set squares and rule, and the unavoidable difficulties consequent upon the use of these either separately or in combination led to an effort for improvement.

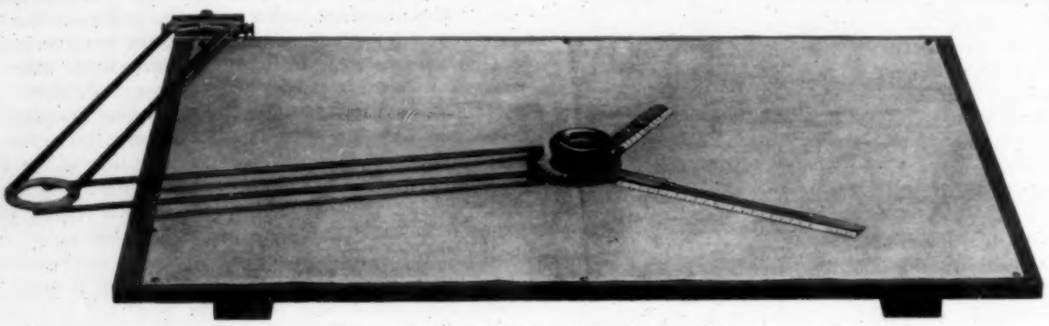


FIG. 1.—THE UNIVERSAL DRAFTING MACHINE.

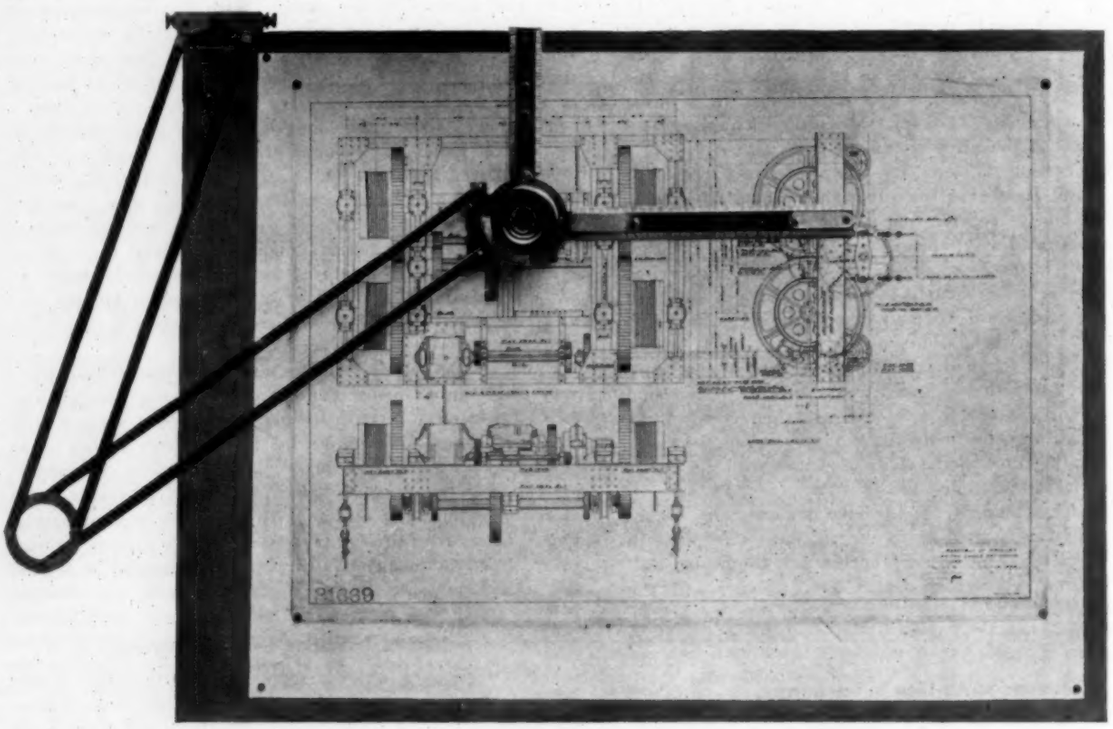


FIG. 2.—UNIVERSAL DRAFTING MACHINE IN USE ON CRANE WORK.

The resulting tool is a linkage system, as seen in the illustrations. The arms are formed of steel rods in pivoted parallelograms connecting the protractor shown on the drawing board with the clamp which is firmly attached to the corner of the board. The arms are flexible so that the blades may rest flat on the paper, and a hinge at the corner clamp permits the tool to be easily raised out of the way or it may be swung to any position on the board or lifted from the paper without

bringing any strain on the pivots of the linkage. The material of which the tool is made is substantial and rigid. The ring is of phosphor bronze, the strips of stiff steel rod and the pins are steel working in phosphor bronze, and the small amount of pressure and motion should indicate but a trifling wear. There is a conical adjustment, however, for taking up all lost motion at the joints and thus the machine may be maintained in excellent working condition indefinitely. The scales or rules are attached by means of a metal strip fastened to one side. This is pushed into a slide on the under side of the protractor and the long contact holds the tool firmly in position. The graduated square has an accurate parallel motion about the drawing board; the square being adopted because the work in most drawings consists of sets of lines at right angles. Both blades of the square are graduated for drawing and measuring lines at the same time. By means of the method of attaching the blades, all are interchangeable and any length and any scale may be supplied.

A conveniently adjusted protractor makes the machine universal. It allows the square to be quickly set at any angle and renders all angular adjustments just as easy, as rapid and as accurate as straight. Spring stops are provided at 30, 45 and 60 degrees, allowing the square to be instantly set at these frequent angles.

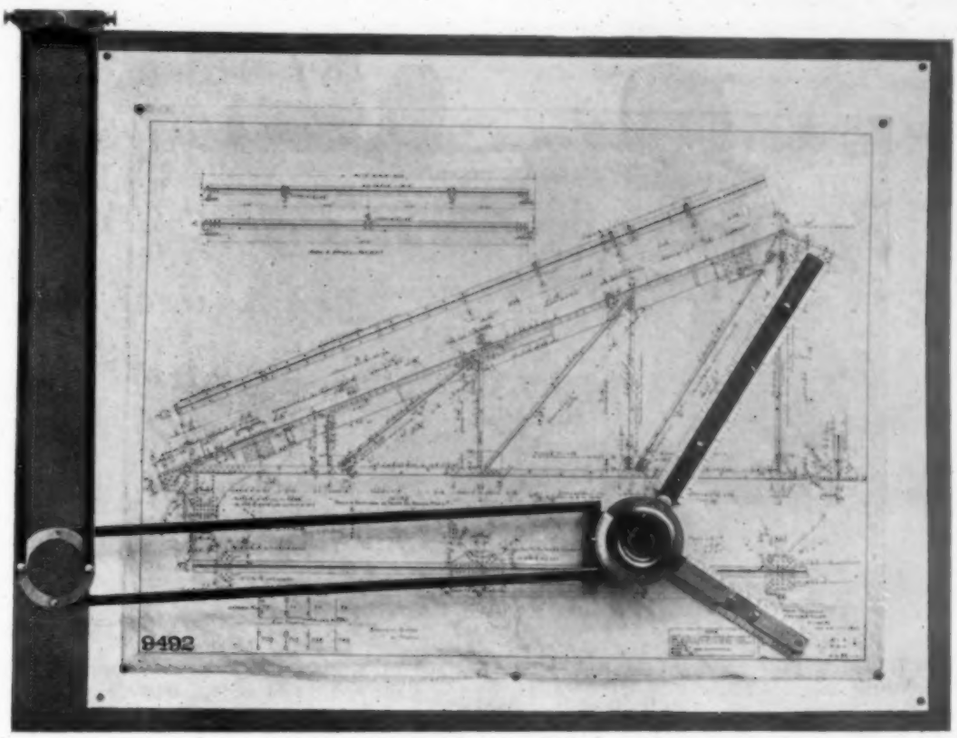


FIG. 3.—UNIVERSAL DRAFTING MACHINE APPLIED TO STRUCTURAL WORK.

The machine has all the appearance of a time-saver of the first order. As a general procedure the draftsman draws a line with one instrument and scales it with another, the line being drawn long enough in the first place. And "long enough" would mean too long under any other circumstances as the additional length of line is a blemish that may lead to error and is in any case a nuisance only tolerated because it is ordinarily difficult to avoid. With the present invention the lines are drawn and scaled with the same edge at the one time and this applies also to angular work. The square is adjusted to an oblique line, clamped there, and then may be moved to any part of the board. The several lines drawn afterwards being parallel to each other so long as the one adjustment is preserved. The device frequently displaces cross-section paper, furnishes a ruling edge by means of which a line may be drawn more rapidly than free hand, takes care of angular work and gives a neat appearance to the finished drawing. The advantages of the instrument in transferring lines in graphic statics is very evident.

Another use of the instrument has been suggested in connection with navigation. It is usual to refer a desired course on the chart to the printed compass which accompanies the remainder of the drawing, this reference being often done by parallel ruler on the chart. It is easy to see the opportunities for inaccuracy in laying off the course in this manner and the readiness with which the universal drafting machine may be applied to any course and then at once referred to the point of the compass. Other novel uses for the instrument will probably appear as the machine is better known. It is manufactured by the Universal Drafting Machine Co., Blackstone Building, Cleveland.

The Morgan Ingot Stripper.

To the Editor:

In justice to all parties concerned I desire to say that the statement in my article on "The Evolution of the Ingot Stripper" (page 67 of your issue of May 1) that the American Steel & Wire Co., of Worcester, Mass., has a Morgan-Taylor stripper built by the Wellman-Seaver-Morgan Engineering Co. was entirely incorrect, and was made through inadvertence on my part. The stripper to which I had reference is of different construction from the Morgan-Taylor stripper. All the rights in the patent on the latter are owned, I believe, by the Morgan Engineering Co., of Alliance, O. I hope that this acknowledgement of my error will remove any misunderstanding which it may have caused. It should be stated also that the Wellman-Seaver-Morgan Engineering Co., of Cleveland, and the Morgan Engineering Co., of Alliance, are separate and distinct companies, and there is no connection between them.

A. E. Fay.

Washington, D. C., May 16.

The semi-annual session of the Central Mining Institute of Western Pennsylvania will be held at Uniontown, Pa., on June 24, 25 and 26. B. F. Jones, division superintendent of the H. C. Frick Coke Co., will present a paper on "Different Methods of Mine Haulage Compared," and H. E. Evanson, assistant chief engineer of the H. C. Frick Coke Co., will present a paper entitled "The Resources and Mineral Wealth of the Connellsville and Lower Connellsville Regions Compared."

The Norton Iron Works of Ashland, Ky., recently declared the second 10 percent dividend since January 1, making 35 percent declared since last November. The company has business ahead for the whole year. It is likely the capitalization will be restored to the former figure of $600,000 from which it was cut down in 1896 to $390,000.

THE WHITON CENTERING MACHINE.

A recently patented centering machine is illustrated in Figs. 1 and 2, and is designed for accurately centering shafts up to 4 inches diameter, that have been previously turned to size. The work is supported in two centering chucks, one of which rotates and acts as a driver. The shaft is firmly held by the rotating chuck, while the end near the tools is supported and rotates in the jaws of the stationary chuck as in a lathe center rest. The centers of the shaft may then be drilled and reamed to the required depth by the drilling and reaming tools which rotate in a direction opposite to the work and at different speeds. In this way the tools produce centers which exactly correspond with the surface of the stock. It is only in this way that a finished shaft can be centered to run perfectly true, and when so centered such shafts may be turned to receive pistons, pulleys, gears, etc., which can be mounted as accurately as upon fully turned shafts and thus a large amount of turning may be avoided. The increasing use and development of the turret machine suggests the availability of a machine of this kind for conveniently centering the product in order that it may afterwards be finished by grinding.

The new machine as here illustrated has the spindle mechanism, headstock and three-jaw centering chuck, used in the regular two-spindle centering machine of the same make, in which the traverse of the spindles is limited by suitable stops and is so designed that neither spindle can be advanced except when on the center. When either spindle is advanced, the head is locked against lateral movement. The machine has also the secondary rotating chuck which may be clamped anywhere on the bed to accommodate the length of material to be centered. Long shafts may pass through the chucks and the projecting ends can be supported on a floor stand if desired.

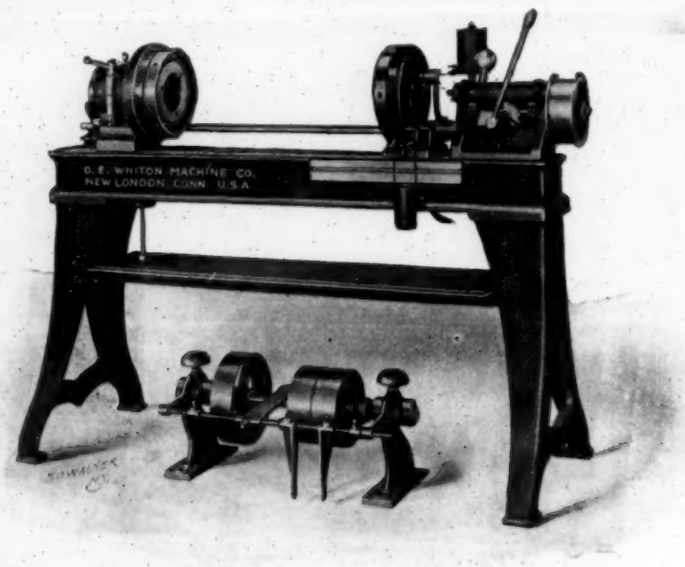


FIG. 1.—THE WHITON SPECIAL CENTERING MACHINE.

The rotating chuck may be swung back out of the way and disconnected by means of a convenient slip pinion for the ordinary centering of rough stock for subsequent turning. In this position the machine may be used in the common method, and is shown as so arranged for ordinary work in Fig. 2. The tool has therefore all the advantages of the regular machine with the addition of the rotating attachment, and in this last particular it is capable of making the extended use of commercially finished shafting for machinery parts much more convenient and economical than heretofore

The machine is built by the D. E. Whiton Machine Co., of New London, Conn.

The North mill of the Republic Iron & Steel Co., Terre Haute, Ind., resumed operations last week after being shut down for two years. The scarcity of muck iron was the reason for resuming. Seventeen furnaces are now in operation.

METHODS OF ANALYSIS FOR CAST IRON.

To the Editor:

We take the liberty of giving you below a description of some rapid methods of analysis of cast iron, which make possible the daily control of manufacture and which are used in the laboratory of our foundry:

Total Carbon.—Weigh one gram of borings, and treat in a beaker of 250 c.c. capacity with a solution of the double chloride of copper and ammonia. Heat on a sand bath at a gentle heat, till the iron is completely dissolved. The residue contains the total carbon. Filter on asbestos in a Gooch crucible. Wash with warm dilute hydrochloric acid then with warm water, and finally with alcohol. Dry in a hot air bath to constant weight. Weigh, burn off in a muffle, and weigh again. The difference of these weights equals total carbon.

Graphite.—The proceeding is similar to the above except that the solution of the double chloride is replaced by dilute nitric acid. The difference in weight before and after burning off gives the graphite.

Combined Carbon.—Total carbon minus graphite equals combined carbon.

Silicon.—In a small porcelain evaporating dish dissolve 2½ grams of borings in a mixture of nitric and sulphuric acids (¾ dilute nitric acid and ¼ dilute sulphuric acid). Evaporate to dryness. Re-dissolve in dilute hydrochloric acid. Filter into a measuring flask of a capacity of 150 c.c. The contents of the filter is washed with dilute hydrochloric acid, and with warm water, and then calcined in a muffle till the carbon is all burned off. Weigh as SiO_2. $SiO_2 \times 0.4701$ equals silicon.

Manganese.—The filtrate from the above is diluted to 250 c.c. Take 200 c.c. (2 grams) in which determine the manganese volumetrically by means of a standardized solution of permanganate.

Phosphorus.—The 50 c.c. remaining from the silica filtrate are precipitated in nitric solution by ammonia molybdate. The precipitate is collected on a filter and washed with a cold solution of potassium nitrate (5 percent) till all acid is removed. The filter and contents are treated in the flask used for the precipitation, with a measured quantity of a caustic soda solution which has been standardized against phosphorus. After solution, color with phenol-phtaleine, and then run in to decolorization a solution of nitric acid of a strength equivalent to the soda solution. The number of c.c. of soda neutralized in the reaction with the precipitate multiplied by the standard of the solution against phosphorus equals the contents of phosphorus.

Sulphur.—Weigh 5 grams of borings. Put them in a flask of 500 c.c. capacity. Close the flask with a rubber stopper

perforated with two holes. Through one of these pass a funnel tube, the lower end of which reaches to the bottom of the flask. Through the other pass an evolution tube, the further end of which passes into a vessel containing a solution of zinc and cadmium acetates. Through the funnel tube pour hydrochloric acid, which attacks the borings, and causes an evolution of sulphuretted hydrogen. This is caught by the zinc and cadmium salts. Finish the solution hot. Aspirate a current of air through the apparatus. Add to the solution of the zinc and cadmium salts hydrochloric acid till the sulphides are dissolved. Add some drops of starch, and titrate with a solution of iodine, the standard of which against sulphur is known.

We hope that these methods will be of interest to your readers, and remain, Yours faithfully,

Brussels, Belgium. H. BOLLINCKX.

[The methods described by Mr. Bollinckx will be recognized as slight modifications of methods commonly used in the United States. The procedure he details for the determination of sulphur is essentially the ordinary "evolution" method. The method for phosphorus is a modification of the "Handy" method. The manganese method as explained closely parallels that of Volhard. The silicon method is the usual one. Graphite is determined in a way not infrequently used. The method for total carbon is one which has been described several times, but always with the specification that the carbonaceous residue obtained cannot be reckoned as all carbon. In thus hastily running over these methods it is likely that M. Bollinckx omitted to mention a factor which is doubtless applied in determining total carbon. We shall be glad to have comments from steel works and foundry chemists that may be suggested by the above communication.]

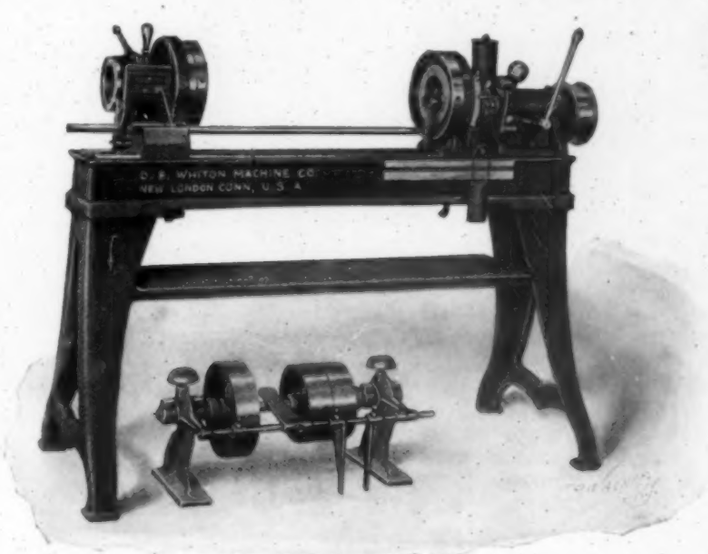


FIG. 2.—WHITON SPECIAL CENTERING MACHINE ARRANGED FOR CENTERING ROUGH STOCK.

The recently completed plant of the Steel Wheel & Wagon Co., at Pueblo, Col., has a main building 300x80 feet. Among the equipment is a 26,000-pound stamping press, used principally in the manufacture of the pressed steel wagon bed. There are also bulldozers, drop hammers, punches, shears, hydraulic tire setters, forges, etc. The capacity of the plant is 5,000 wagons a year and an equivalent amount of work in other lines. The company will also build mining and shop cars and barrows, steel rollers, scrapers, etc.

The annual meeting of the Banner Electric Co., Youngstown, O., was held last week and directors were chosen as follows: J. E. Lippincott, Thomas Carr, Charles N. Crandall, Fred Keast, F. Kirchner, R. T. Hamilton and N. L. Norris. Considerable new machinery will shortly be installed and an addition will be built to the plant.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.

At the regular monthly meeting of the Engineers' Society of Western Pennsylvania held on Tuesday evening, May 20, at the society's headquarters, 410 Penn Ave., Pittsburg, papers were presented dealing with "High Office Buildings." Mr. Charles Worthington, C. E., presented a paper on the steel frame work for high buildings, dealing with the general features and types, design, loadings, foundations and wind bracings. C. A. McClure read a paper on the relation of the architect to the engineer and gave some interesting data on features connected with the erection of the Keystone Bank Building, at Pittsburg. William Copeland Furber discussed high buildings from an insurance point of view, while Peter B. Wright discussed fire proofing of high buildings. H. B. Chess presented some stereopticon views illustrating concrete and expanded metal floor construction and Capt. J. A. A. Brown discussed high buildings from the viewpoint of superintendent of the bureau of building inspection, which position he now holds in Pittsburg. The following were admitted to membership in the society:

Charles F. Albrecht, superintendent of the Painter mills of the American Steel Hoop Co.; Thomas J. Bray, Jr., chief engineer of the United Engineering & Foundry Co.; Elias Chesrown, Westinghouse Electric & Mfg. Co.; George G. Crawford, manager of the National department of the National Tube Co.; A. W. Crouch, manager Dearborn Drug & Chemical Co.; E. J. Dittmar, assistant superintendent of Painter mills of the American Steel Hoop Co.; C. E. Downton, Westinghouse Electric & Mfg. Co.; James McA. Duncan, Westinghouse Electric & Mfg. Co.; George B. Dusinberre, Westinghouse Electric & Mfg. Co.; H. C. Ebert, Westinghouse Electric & Mfg. Co.; F. A. Ensign; R. S. Feicht, Westinghouse Electric & Mfg. Co.; F. L. Fugate, H. K. Porter Co.; E. D. Hancock, with Julian Kennedy; H. S. Harrop, civil engineer H. K. Hitchcock, engineer; N. L. Hopkins, with S. A. Taylor; L. S. Kinnaird, with Pennsylvania Co.; H. E. Longwell, Westinghouse Machine Co.; A. E. Maccoun, superintendent electrical department Carnegie Steel Co.; Ralph Morganstern, with Central District & Printing Co.; George C. Mors, assistant chief engineer the American Tin Plate Co.; Daniel A. Munroe, superintendent Pittsburg Meter Co.; M. W. McGaffey; Percy Nicholls, Westinghouse Electric & Mfg. Co.; E. W. Pargny, manager American Sheet Steel Co.; A. R. Raymer, assistant chief engineer Pittsburg & Lake Erie Railroad; H. B. Robinson, superintendent Pittsburg Valve, Foundry & Construction Co.; T. H. Schoepf, Westinghouse Electric & Mfg. Co.; Z. H. Sikes, Riter-Conley Manufacturing Co.; John H. Smith, Westinghouse Companies' Publishing Department; Thomas Wood, Carnegie Steel Co.; Theodore Varney, Westinghouse Electric & Mfg. Co.

A $5,000 DIVIDEND TO EMPLOYES.

The Hyde Windlass Co., of Bath, Maine, has taken the unusual course of distributing in the neighborhood of $5,000 to its employes as a purely voluntary experiment in dividend sharing. The management found that the profits obtained from a very prosperous business year were sufficient to permit the usual dividend, retain an adequate reserve and be in a position to vote a further allowance to the stockholders. The directors carefully considered the matter and for reasons set forth in the following circular letter to the employes the sum of $5,000 was distributed among some 200 wage-earners.

"At the beginning of the year, a few of the companies with whom we have had dealings announced that they had shared a portion of their profits with their employes. This idea appealed to the directors of this company, and as indications pointed to the fact that at the beginning of its business year, May 1, 1902, the company would be able to pay the usual dividend to its shareholders, and at the same time make a dividend to its employes it was decided to consider the matter. At a meeting of the directors which was called in February to discuss the question, it was decided, as the company had had a prosperous season's business, and as the prosperity was due in a measure to the hearty co-operation of its employes, that a dividend be paid on May 1 to all persons in the employ of the company, who had been with them for a period of one year or more. It was also decided that employes who had been with the company six months or more, but less than one year, should receive half this dividend.

"It was decided by a unanimous vote to fix this dividend at 5 percent on the capital stock of the company, said dividend to be divided among the employes in amounts proportionate to the salary or wages received by each person. The company does not guarantee to continue this plan of co operative dividends, as future conditions may not warrant it. It desires, however, to do so, and it is hoped this feature can be made permanent."

The company sends a copy of the foregoing circular in reply to a request for further particulars and also encloses a copy of a letter it has sent recently in response to some inquiry as to the bearing of such profit distribution upon the labor question. In this latter letter the company says among other things:

"The idea of an employes' dividend was suggested to us by the fact that several of our business acquaintances had made presents to their employes on Christmas or New Year's day. In regard to the inquiry how far this plan would tend to solve the labor question, it is the writer's opinion that it would have very little bearing on the subject, for the reason that the class of workmen who have to be watched or bribed to induce them to render a fair equivalent, would never be satisfied under any conditions, while the workman whose interest is in his work, and who works for the interest of his employers, will do so in any case, so long as he is satisfied to remain in their employ.

"Our object in making this dividend was to show our appreciation of services faithfully rendered rather than as an incentive for workmen to do more. The mechanics employed by this company as a rule are skilled in their various trades, and are generally men who have a good common school education, and are mostly descended from good old New England stock; in fact, many of them are the sons of prominent men in this section, who have the correct idea of learning and working at a good trade, and who do not consider it degrading to do so. In our experience we have found that such men as these take the proper view of the labor problem, and believe that the best way to advance their own interests is to do all they can in the interest of their employers. This no one of intelligence, whether workman or employer, can question, and our idea of the correct solution of the labor problem is to employ so far as possible men of this caliber, and for employers to show their appreciation of the men's efforts in their behalf in some substantial manner.

"Without perfect harmony between employer and employe, it is impossible to obtain good results, and while this company does not propose to employ men in any capacity in whom it has not perfect confidence, it believes that the right sort of men like to be appreciated, and it is to be hoped that the plan of co-operative dividends may result in keeping up the present high standard of our workmen."

The probability of a strike occurring at a plant, capable of being conducted on a plan of this kind, would seem to be exceedingly remote. It would be evident to every workman that the continuance of profitable conditions would be the only way to ensure dividends and any serious interruption of operations would destroy hopes of a percentage of the company's earnings. The strike does in all cases hurt the workman but the loss is not commonly realized at the close of the year so far as he is concerned. As a contingent partner or stockholder the case would be essentially different. With prospects of a share in dividends he is placed on the plane with owners of capital stock and is then in a position more clearly to realize the unison of the interests of workman and employer. Industrial peace can only be attained, if that desirable consummation is ever to be fully realized, by a recognition of such a communal dependence, and the experiment at the works of the Hyde Windlass Co. will be followed with sympathetic interest by students of labor conditions.

Tin Plate Mill Wage Questions.

At the recent convention of the Amalgamated Association of Iron and Steel Workers held at Wheeling, W. Va., it was decided to enforce the eight-hour day on all finishing mills that have improvements that enable them to be kept in continuous operation throughout the 24 hours of the day. This was embodied in the following resolution:

"All 10-inch, guide and hoop mills with one furnace averaging $35 per turn or more, or with two furnaces $65 per turn or more on a nine and one-quarter-hour system, based on a 1-cent card rate, the eight-hour system shall be adopted. On bar and 12-inch mills averaging 60,000 pounds on one furnace, and 85,000 pounds on two furnaces per turn on the nine and one-quarter-hour system, the eight-hour system shall be adopted."

The national convention of the Tin Workers' Protective Association wound up its business at New Castle, Pa., last week. A new scale was adopted providing for a slight advance and the delegates went on record as opposing the adoption of a continuous scale with the American Tin Plate Co. The present scale year expires on July 15, and a conference will be held with the officials of the American Tin Plate Co. regarding the new scale in about two weeks. Officers were elected as follows: President, George Powell, of New Castle, secretary and treasurer, Charles E. Lawyer, of Wheeling, W. Va.; vice presidents—First district, Grant Jacobs, Elwood, Ind.; second district, Bent L. Bartlett, New Castle; third district, H. E. Barrett, McKeesport, Pa.; fourth district, James Smith, Martin's Ferry. Board of trustees—Benjamin Teagarden, Martin's Ferry, O., chairman; J. W. Elder, New Castle, and E. E. Katterhenry, Elwood, Ind.

Canton Crucible Steel Company.

The Canton Crucible Steel Co., of Canton, O., has been recently reorganized, additional capital has been secured and it is probable that the plant will be somewhat enlarged. The product consists of a high grade of tool steel. In addition the company makes a specialty of pricked plates and pricked wordles for wire drawing. This is the only concern in the United States manufacturing these plates and wordles, the bulk of them now used in the wire mills of this country coming from England. It is stated that the Canton concern can manufacture the plates of as high grade steel as the English manufacturers, at somewhat less cost. Where they have been used they have been found equal and superior to the English makes. The product of the company will be handled by Alexander Forbes Adam, formerly in charge of the cold rolled department of Jones & Laughlins, Ltd., Pittsburg. The headquarters of the company are located at 1346 Etna St., Pittsburg. Agencies have been established in all the large centers throughout the country.

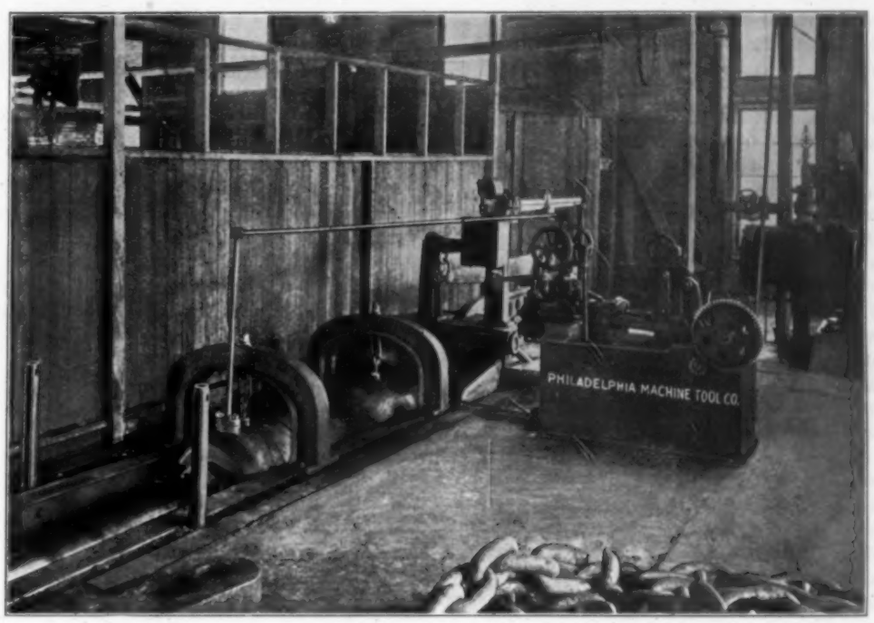
The Youngstown Iron Sheet & Tube Co., Youngstown, O., put its 52-inch sheet mill in operation this week.

300-TON CHAIN TESTING MACHINE.

An indication of the growth of structural and engineering work is found in the demand for large chain, at once an index of the increase in size of engineering works and of the increased number of such large operations. The manufacture of large chain is still an "infant industry" in this country, and the Lebanon Chain Works, of Lebanon, Pa., are pioneers in it. Reference was made in these columns recently to their success in manufacturing some of the largest chain yet made. It will be interesting to have some details of the testing machine used to prove it and to break the triplets. This machine was designed and built by the Philadelphia Machine Tool Co., 443 North Darien St., Philadelphia. J. W. Bramwell, of that company, some years ago enlarged the machine of the Boston Navy Yard to 600,000 pounds capacity, and these two machines are today probably the only successful lever machines of this size in this country. The Emery machine at Watertown Arsenal is probably the only other machine that will weigh 300 tons. This statement of course excludes the crude machines consisting of simply a hydraulic ram with a gauge to record the pressure in the cylinder. While there are several such machines in use the results they give are too rough and inaccurate for acceptance by engineers.

The illustration shows the machine built by the Philadelphia Machine Tool Co. The pulling and weighing mechanism are at the same end. The ways extend to the left so as to take the required 90 feet of chain for proving and, beside the anchor at the outer end, have a breaking head inserted about 12 feet from the cylinder for breaking the triplets. These heads are beyond the limit of the picture, but a portion of the ways may be seen as they extend past the cylinder. The pulling mechanism of the machine consists of a hydraulic ram with the feed pump. The cylinder is of 16-inch bore and the rod has a stroke of 7 feet. The bore is highly polished to save the leather packing, a special feature is the quick return of the ram. The cylinder is nicely hung from two arches and the recoil which is very great when a piece breaks is most successfully taken by a careful disposition of springs. The pump for supplying the cylinder has two cylinders, high and low pressure, and each is double acting. Its very large capacity has helped to greatly reduce the time heretofore lost when testing. Another feature of this pump is the adjustable stroke on the high pressure cylinder. The low pressure pump automatically goes out of action at about 300 pounds to the square inch. The pressure then runs up rapidly with only the small cylinder working, but the operator can control this rapidity by reducing the stroke.

The weighing mechanism is erected immediately behind the cylinder. While this arrangement takes up a little more space by adding about 6 percent to the total length of the machine there are many advantages over the plan of placing the levers above the cylinder. The weighing levers and beam are mounted on a trussed frame which makes the weighing mechanism entirely self contained. The total pull of 600,000 pounds is divided between two bell crank levers placed one above the other. These levers are very massive and cast in steel. The leverage is further reduced in the usual manner. The beam is of the micrometer screw type; that is, the poise is moved out on the beam by a screw lying along its top and the end of this screw has a divided head. The marking on the beam is only for even thousands and the divided head on the screw gives the reading for every 5 pounds up to 1,000. The poise is divided into two equal parts, and as each half travels the length of the beam, this device is equivalent to making a beam twice as long fitted with a poise in one piece and the delicacy of reading due to a long beam is thereby obtained. In use the operator throws into gear one poise and and runs it out to the end of the beam. At 300,000 pounds this poise is at the end of the beam and is automatically thrown out of gear with the screw. If the specimen runs beyond 300,000 pounds the operator throws in the next poise without moving from his position, and runs it out to the point where the specimen breaks.



CHAIN TESTING MACHINE BUILT BY THE PHILADELPHIA MACHINE TOOL CO.

The machine illustrated has been subjected to very severe tests in operation. It has carried considerably beyond the rated capacity when testing it. In use it has proved 665 fathoms of 3 3-16-inch chain and broken 33 triplets in six hours. The time for breaking the 33 triplets was one hour and a half. They are required to exceed 510,000 pounds, which all of them succeeded in doing and one of them went up to 548,000 pounds. It is claimed that this is by far the quickest work ever done on a testing machine, and it is notable that on careful inspection after the continual heavy concussion due to the recoil not the slightest adjustment was found necessary.

A regrettable error was made in the statement in our last issue that the West Duluth Furnace had been removed to Milwaukee and become part of the reconstructed Minerva Furnace. John M. Thomas, who bought the West Duluth Furnace property a few years ago, became identified with the Minerva Furnace last year, but the West Duluth Furnace, though out of blast, is intact and it is expected that it will be put in operation within the next 60 days under new management, as referred to elsewhere in this issue.

The Tonawanda Iron & Steel Co., North Tonawanda, N. Y., has granted its employes a voluntary advance in wages amounting to 10 percent.

CINCINNATI MACHINERY MARKET.

Machine tool builders in Cincinnati report a widening market. A number of the large concerns that have heretofore had a considerable foreign business report that the demand from European countries is improving steadily. As far as reported the improvement is largely in Germany though there has been something of a demand from Denmark, Italy and France as well. The domestic trade keeps up very satisfactorily, and particularly in the South, the territory into which Cincinnati ships all sorts of goods. All of the shops are running in full and some of them are running night shifts.

The Cincinnati Shaper Co. has purchased a large tract of ground on Colerain Ave. and will erect a large brick and steel building. This concern has increased considerably in the last year or two and has developed a large trade all over this country with a good demand from abroad. It is expected that the new building will be ready for occupancy by fall.

The Fosdick-Holloway Machine Tool Co. has received an order from the Baldwin Locomotive Works for three additional radial drills, similar to the one recently installed in that plant. The concern has also sold two large radial drills to the Mosler Safe Co., a duplication of a former order placed by that company, and two also to the Cramp Ship & Engine Building Co., Philadelphia.

The Cincinnati Milling Machine Co. reports that while March was the largest month in its history the business since then has kept up exceedingly well and the promise is that after the dull period of the summer has passed the concern will make a new record in the fall. This company has received orders during the past month from nearly all of the European countries including a good business from Germany and a continued satisfactory volume of trade with England. The company shipped the other day a considerable order to Kimberly, South Africa.

The J. A. Fay & Egan Co. reports a very good domestic business in all kinds of wood working machinery, though there is but a small percentage of the foreign demand that this concern used to enjoy a short time ago previous to the tariff trouble between this country and Russia.

The F. M. Watkins Co., during the past week, purchased an additional piece of property on which will be erected part of the new plant soon to be occupied by that concern on Colerain Ave. The property immediately adjoining, that is to be used for building thereon the plant of the Lynn Filter Mfg. Co., was also transferred to the new owners this week.

John Steptoe & Co. have purchased property in the west end, for which they have been negotiating for some time and on which a new plant will be built.

The Block-Pollock Iron Co. reports that its business since getting into its new machine shop is practically three times what it was about a year ago. Last year the concern was compelled to refuse a good deal of business; this year it is unable to take care of a great deal more and the output of the plant is practically three times what it was before.

The Columbia Iron Works Co. is building a new structure on Reading Road in which the concern will carry on its business. The company is a new one engaged in the manufacture of architectural iron work. The building is to be 100 feet square. Robert E. Sweeney is one of the principal members of the concern.

The Lodge & Shipley Machine Tool Co. has the foundations in and some of the upper work done for the addition to its plant that will practically double its capacity.

The Prosperous Locomotive Industry.

The Baldwin Locomotive Works turned out 128 locomotives in April. Heretofore 1,300 a year has been the best record. An officer of the company says: "The field for exporting locomotives is not very flattering at present. In portions of Europe there has been a recent overproduction, so that at this time there is no large demand for engines. The comparative ability of American and foreign manufacturers to contract for quick delivery has become reversed of recent months. A year or two ago we would have agreed to fill a foreign order in four or five months, or even in ninety days, if it was for a single locomotive. Today we will not guarantee delivery short of eight or nine months. The conditions in Germany are particularly discouraging at this time to American locomotive companies. The German builders have put themselves into such a position as to enable them to go to England and take large orders there, underbidding the English firms. Much of this work is filled at a loss. But the result is to keep American competitors in this line of manufacture out of the German market. We have every encouragement to bid, but no chance to secure the work at figures at which we are willing to manufacture. It is all, to a considerable extent, a reflection of the condition of pressure under which the American iron and steel business now labors. However, we do not complain. If our works' capacity were doubled we would have orders for all we could do."

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

"Crane," care of *The Iron Trade Review*, wants to buy a second hand truck crane with counterbalance; capacity about 5 tons.

The Mississippi Foundry & Machine Co., of Meridian, Miss., has increased the capital stock from $20,000 to $30,000.

The Woodward Governor Co., Rockford, Ill., has been incorporated with a capital stock of $30,000 by E. E. Woodward, Stanton A. Hyer and A. M. Keal.

The Haish Wire & Implement Co., De Kalb, Ill., has been incorporated with a capital stock of $100,000 by Jacob Haish, C. H. Salisbury and B. S. White.

The F. A. Bergman & Sons Co., Chicago, has been incorporated with a capital stock of $10,000 to manufacture sheet metal and iron goods. The incorporators are John M. H. Burgett, Elphick R. Ede and Frank A. Bergman.

The Republic Railway Appliance Co., Chicago, has been incorporated with a capital of $100,000 for the purpose of manufacturing railway cars, locomotives and railway appliances. The incorporators are Thomas F. Sheridan, Annie C. Courtney and J. E. Rupp. The company has offices at 531 Marquette Building, Chicago.

The Eagle Manufacturing Co., Peoria, Ill., has been incorporated with a capital stock of $10,000, to manufacture agricultural implements. The incorporators are C. P. Fester, Ferdinand Feldt and Henry Oelkers.

The Minneapolis Implement Mfg. Co., Minneapolis, Minn., has been organized with a capital of $300,000. The incorporators and officers are: President, J. M. Bowler; vice presidents, John Beutner and A. L. Cramb; secretary and treasurer, James Rooney.

The Stewart Iron Co., Sharon, Pa., is planning for the erection of a plant for the manufacture of cement from slag.

The Southern Car Wheel Iron Co., of Tallapoosa, Ga., has been incorporated with $100,000 capital. The company has purchased from the Georgia Vineyard Co. the charcoal furnace at Tallapoosa which has a daily output of 40 tons. The furnace will be placed in operation about July 1 after a year's idleness.

The Lawton Gas Engine Co. has been incorporated at Wabash, Ind., with $50,000 capital. The Lawton foundry will be purchased by the new company and will turn out the castings for the engines to be built.

The Otto A. Meyer Co., of Milwaukee, Wis., has been incorporated with $100,000 capital. The company will deal in horseshoes and will do jobbing work in iron and steel. Otto A. Meyer, D. C. Meyer and H. C. Meyer are the incorporators.

The directors of the Railway Steel Spring Co., of Pittsburg, have recommended the purchase of the properties of the Steel Carriage Wheel Co. and a meeting of the stockholders will be held in June for the purpose of voting upon the proposition. Should the deal go through the capital of the Railway Steel Spring Co. will be increased from $20,000,000 to $27,000,000.

The Penokee Iron Mining Co. has been organized at Ashland, Wis., for the purpose of developing iron properties in Wisconsin.

The Doscher Plane & Tool Co., of Norwalk, Conn., has

been organized with $25,000 capital for the purpose of manufacturing machine tools. The incorporators are O. O. Ozias, D. H. Morris and Martin Doscher.

The Acorn Brass Works, Chicago, has increased its capital stock from $50,000 to $100,000.

The Logan Boiler & Machine Co., Philadelphia, Pa., has been incorporated with $50,000 capital. P. W. Janeway, F. Logan, H. L. Hodge and G. W. Kimball are the incorporators.

The Johnson City Foundry & Machine Co., Johnson City, Tenn., has been incorporated with $25,000 capital. G. W. Sitton, R. M. Rhea, J. A. Smith, T. J. Peed and B. J. Sitton are the incorporators.

The William & Philip Medart Patent Pulley Co., St. Louis, will let contracts to the value of $60,000, for the rebuilding and equipment of a plant to replace the one burned May 4.

The W. B. Mitchell Skein & Foundry Co., Chicago, has been incorporated with a capital stock of $30,000, to succeed unincorporated company of same name. The incorporators are Walter B. Mitchell, Fred D. Jackson and George N. B. Lowes.

The LaCrosse Threshing Machine Co., LaCrosse, Wis., has been organized with a capital of $100,000 to manufacture threshing machinery. The incorporators are Joseph Borchert, R. C. Smith, C. C. McConville and R. L. Davis.

The Rockdale Iron Co., of Nashville, Tenn., has been incorporated with $25,000 capital. J. J. Gray, J. M. Locke, N. C. Hopkins, T. B. Baldwin and G. Hughes are the incorporators.

The American Pipe & Foundry Co., Bessemer, Ala., has been incorporated with a capital of $100,000 for manufacturing iron pipe, hydrants, valves, car wheels, etc. The incorporators are W. J. Long, T. Y. Huffman and H. C. Mead.

The Mutual Machine Co., Washington, N. C., recently organized, has purchased a site for its plant, and will begin at once the erection of its proposed foundry and machine shops.

The Hardwick-Connor Machine Co., Dallas, Texas, has been incorporated with a capital of $10,000 by W. O. Connor, S. W. Hardwick and E. C. Connor.

The Richards Machine Co., Atlanta, Ga., is in the market for two 14x30 Corliss engines. Give full particulars as to condition when replying.

The Muscadine Mining Co., Iron City, Ala., is in the market for locomotives, cast iron pipe, automatic dump cars, standard gauge, of 10 tons' capacity; stationary engine and boiler, water tank, pump and boiler, sheet steel and 40-pound rails.

The Birmingham Rail & Locomotive Co., Birmingham, Ala., is in the market for a combined punch and shear capable of punching 1-inch hole in iron 1 inch thick.

The West Allis Malleable Iron & Chain-Belt Co., West Allis, Wis., has been incorporated with $100,000 capital. A plant will be built at West Allis within 90 days for the manufacture of chain belts. W. H. Shenners, C. S. Otjen and George M. Gleisner are the incorporators.

The Penn Iron & Coal Co., Canal Dover, O., has increased its capital stock from $200,000 to $500,000.

The National Corundum Wheel Co., Fort Hall, N. Y., has been incorporated with $50,000 capital. O. R. Sprague, J. F. Spohn and John Scheidt are the incorporators.

The South Bend Sundry Mfg. Co., of South Bend, Ind., has been incorporated with $5,000 capital for the purpose of manufacturing articles from iron and steel. B. W. Perkins, H. M. Kauffman and R. C. Ogle are the incorporators.

The Louisville Bolt & Iron Co., Louisville, Ky., has increased its capital stock from $150,000 to $350,000. The increased capitalization will be utilized in the erection of a sheet mill, plans for which are now being prepared.

The Burns Foundry & Machine Co., Brooklyn, N. Y., has been incorporated with $6,500 capital. Robert Burns, Jr., W. F. King and E. W. Smith are the incorporators.

The Sleeper Engine Co., Ltd., Montreal, Que., has been incorporated with $250,000 capital to manufacture engines, boilers and accessories. A. Watt, J. A. Jacobs, E. A. Mahon, F. H. Sleeper and A. R. Oughtred are the incorporators.

New Construction:—

The West Davenport Foundry & Machine Co., Davenport, Iowa, has had plans prepared for an addition to its plant. The locations of the present machine shop and foundry buildings will be changed and enlarged.

The Cedar Rapids Pump Co., Cedar Rapids, Ia., is building an addition to its plant to cost $3,000.

The Murphy Boiler Works, Pekin, Ill., will be moved to Peoria, Ill.

The American Bridge Co. has been awarded the contract by the Milwaukee Electric Railway & Light Co., Milwaukee, for the erection of the latter's new terminal station and office building.

The Stormont Foundry & Machine Works, Ottawa, Ill., W. H. Knowles, proprietor, is being enlarged by an addition to the machine shop, 30x40 feet.

The O. C. Kelly Engine & Threshing Machine Co., Springfield, O., will remove its plant to South Milwaukee, Wis.

The Fred M. Prescott Steam Pump Co., Milwaukee, Wis., will shortly remove its plant to West Allis, where new buildings have been erected.

W. M. Crilly, 167 Dearborn St., Chicago, has a general contract for erecting a two-story machine shop, blacksmith and wagon shop, brass foundry, etc., at Wentworth Ave. and 79th St.

New buildings to be erected by the H. Adler Co., at Carnegie, Pa., include a foundry 30x150 feet, a molding room 40x300 feet, a finishing room 30x120 feet, a store and stock room 250x200 feet, an enameling room 50x100 feet, a press room 30x100 feet, and an engine house. With the exception of the press room, which will be a two-story brick and steel structure, the buildings will be one story and iron-clad. The estimated cost of buildings and equipment is $75,000.

The American Steel & Wire Co. is erecting a large wire plant and warehouse at San Francisco, Cal., which, when completed, will replace the old California Wire Works at North Beach. The new plant will be built on a site of 5½ acres and the main building will be 520 feet long on one side and 460 feet on the other. The width will vary from 180 feet to 130 feet. The manufacture of wire cables, well drilling ropes, furniture springs, etc., will be extended.

The Chicago City Railway Co., Chicago, will erect a large plant for doing all its own machine work, repairs, etc. The machine shop will be 238x202 feet; brass foundry and frog shop, 140x92 feet; blacksmith and wagon shop, 280x92 feet; power plant, 100x59 feet; barn for wrecking wagons, 35x100 feet; paint and carpenter shop, 354x492 feet.

The Valley City Machine Co., Grand Rapids, Mich., will erect a machine shop, 33x65 feet, two stories high.

The General Foundry Co., of Gardner, Mass., is putting in the foundation for a brick foundry to cost $3,000, and contemplates erecting also an office building and pattern shop.

William Dobson, manufacturer of molders' tools will soon erect a new plant at Canastote, N. Y.

A contract has been awarded Hayden, Appleyard & Co. for the new building of the Valley City Machine Works, Grand Rapids, Mich. The contract price is $4,500.

Work has commenced on a two-story machine shop for the Quaker City Electric Co., of Philadelphia. It will be of brick and slow burning mill construction and will cost about $10,000.

Fires and Accidents:—

The plant of the Enterprise Stove Co., of Vincennes, Ind., was damaged $200,000 by fire May 17.

The old machine shop and foundry building of the Goodsell Co., of Leslie, Mich., were destroyed by fire last week. Loss $11,000.

The blacksmith shop at the works of the American Car & Foundry Co., Terre Haute, Ind., was destroyed by fire May 8, causing a damage of $15,000. The building will be rebuilt.

The Pittsburg District:—

The Pittsburg Reduction Co. will build a large aluminum plant at Massena, N. Y., where the St. Lawrence Power Co. has erected an immense electrical power station. Power for the operation of the plant will be furnished by the immense central power station. A site of 100 acres has been secured upon which two buildings covering 15 acres will be erected and which will cost about $500,000.

Work on the new plant of the Pittsburg Steel Co., Monessen, Pa., is progressing favorably and by September will be

in complete operation. The plant is being erected by Wallace H. Rowe, John Bindley, Emil Winter, Willis F. McCook, W. C. Reitz and others and will be one of the most modern in the country. The works will be equipped with three continuous heating furnaces, two annealing furnaces and a complete semi-continuous rod mill, the latter consisting of one 16-inch, one 14-inch and three 12-inch trains, and equipped for rolling 4-inch billets direct into No. 5 wire rods. The annual capacity will be 130,000 gross tons. The wire drawing department contains 160 wire-drawing blocks, with an annual capacity of 112,000 tons; a wire nail department, containing 175 wire-nail machines of an annual capacity of 1,250,000 kegs. A galvanizing department will be connected with the works. It will have an annual capacity of 45,000 gross tons. Barb wire and field fencing departments, with an annual capacity of 27,000 gross tons will also be operated.

No. 3 furnace of the Etna plant of the American Steel Hoop Co., at Etna, Pa., was blown in last week after having been idle for a considerable period undergoing repairs.

The sheet metal workers of Pittsburg and vicinity were last week granted a 10 percent advance in wages the minimum being 37½ cents an hour. The new scale is an increase of 7½ cents per hour.

Henry Ulrich, machinist and pipe fitter, will erect an 80x100 foot extension to his plant in Allegheny, Pa. A 20-inch hydraulic pressure bending machine is also being installed.

W. G. Park, formerly connected with the Crucible Steel Co. of America, in the capacity of director has decided to erect a plant for the manufacture of springs, axles and other railway supplies near Elizabeth on the Monongahela River.

Wickes Bros., of Saginaw, Mich., boiler manufacturers, have purchased the property upon which their present warehouse is located on 45th St. and the A. V. Railway. Additional property was leased extending to 46th St. upon which a machine shop and boiler plant will be built. This company has been eminently successful in dealing in second hand machinery and boilers since the establishment of its immense warehouse in this city.

General Industrial Notes:—

The Page Woven Wire Fence Co. is now employing nearly 600 men at its Adrian (Mich.), plant and about 700 men at its rod and wire mills at Monessen, Pa. The experiments of J. Wallace Page, the founder of the enterprise, were begun 17 years ago, according to a recently published sketch. He was engaged in farming when he first developed his patent. Later he began making wire fencing in a wooden building in Adrian. In 1889 a company was incorporated. Prominent in the growth of the business were Chas. M. Lamb, now manager of the Monessen plant, and Frank E. Harvey, superintendent of the works at Adrian. The building of the Monessen plant in 1899 and 1900 and the delay in its completion led to embarrassment, but the receivership of the Michigan plant lasted but five months. The reorganization which was effected by Leslie B. Robertson, acting for the majority of stockholders, resulted in a company with a capital of $1,000,000. A reincorporation followed with $8,000,000 capital, under New Jersey laws. The management of the company and the sales and executive offices remain in Michigan. The officers and directors are as follows: J. Wallace Page, Adrian, president; Austin Clement, Chicago, vice president; C. M. Lamb, Monessen, Pa., second vice president; secretary, Athur B. Cody, Chicago; treasurer, Leslie B. Robertson, Adrian; Charles E. Locke, J. Charles Davis, H. B. Parsons, New York; S. W. McMunn, D. N. Hansen, Chicago; D. M. Baker, John E. Carr, Adrian.

The Business Men's Club, of Ironton, O., is considering a proposal for the establishment of a gas engine and molding machine plant in that city. Four or five acres of ground are required and the buildings talked of are a foundry, 80x200 feet; cleaning and chipping department, 80x100 feet; machine shop, 80x200 feet, in addition to a pattern-making and pattern storage building, 40x100 feet.

The Chicago Pneumatic Tool Co., Chicago, has recently received an order for three large Franklin air compressors for the Philadelphia & Reading; two compound air compressors, of 2,000 cubic feet capacity, for the New York, New Haven & Hartford, to be installed in its shops at Reading, Mass., and one compressor for the Atchison Topeka & Santa Fe.

The Holthoff Machinery Co., Cudahy, Wis., reports that its plant is now nearly completed. The works are equipped in the latest manner, a railroad track running into each building. Two 20-ton Pawling & Harnischfeger cranes and a Nordberg engine are being installed.

The Dings Electro-Magnetic Separator Co., Milwaukee, Wis., has been granted another patent on its magnetic separator for handling cupola cinder and foundry refuse. The business of this company has more than doubled during the past year, and it is now contemplating the erection of a new shop.

The Great Northern Construction Co., Harvey, Ill. (Chicago suburb), which was recently organized, has purchased the plants of the Standard Boiler Mfg. Co., and the Harvey Boiler Works, both of Harvey, and has enlarged and equipped them with new machinery. The new tools installed include an entire new boiler and engine plant, dynamos, motors, electric lighting apparatus, electric traveling crane and auxiliary cranes; new punches, both single and gang; power riveters, etc. The present capacity of the shops is 50 tons of plate work a day. By July 1 it is expected to have the capacity increased to 100 tons a day. The officers are R. M. McElroy, president and treasurer, and Otto Gresham, secretary.

The converting department of the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., resumed operations last week after a shutdown of several weeks. A settlement was effected with the employes of this department who asked for an 8-hour day. The rolling mill department also resumed.

At the annual meeting of the stockholders of the Buffalo Iron Co., held at Nashville, Tenn., last week it was decided to consolidate its properties with those of the Bon Air Coal Co. The new corporation is to be known as the Bon Air Coal & Iron Co.

The first portion of the new continuous mill at the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., was placed in operation for the first time this week.

The Sylvan plant of the Republic Iron & Steel Co., Moline, Ill., is to be improved during the summer so that operations can be resumed during September. The 8-inch and 16-inch mills will be torn out and will be replaced by new mills with continuous heating furnaces. About $65,000 will be spent in improvements.

The Portsmouth Steel Co., Portsmouth, O., has purchased a tract of 42 acres of land adjoining its plant. Coal tipples will be erected on the Ohio River from which coal will be conveyed to the plant. Two additional open-hearth furnaces will be constructed.

The blast furnace plant of the Duluth Furnace Co., Duluth, Minn., together with 160 acres of land upon which the plant is located has been sold to a party of Chicago and Cleveland capitalists who will put the furnace in operation as soon as it can be enlarged and repaired. When these improvements are completed the furnace will have an output of about 225 tons per day. The furnace was originally built in 1888-1890 by the Duluth Iron & Steel Co. at a cost of $225,000. It was leased later to A. W. Himrod, of Chicago, who contracted for the sale of the entire output to the West Superior Iron & Steel Co. Owing to the failure of this latter concern, however, the furnace was compelled to suspend operations until 1899, when it was purchased by J. M. Thomas, of Niles, O. He made many improvements, expending about $60,000, but in 1900 the furnace was shut down and has been idle ever since.

The Allis-Chalmers Co., Milwaukee, Wis., has received an order for five blowing engines from the Carnegie Steel Co., to be installed at the furnace plant to be built in the Pittsburg district, and one for the Joliet plant of the same company. Contracts have also been closed for the erection of two additional engines of 12,000 h. p. capacity for the New York Broadway Underground Railway Co. The erection of the new works at West Allis, Wis., is progressing favorably. Contracts were awarded last week for six additional buildings which will contain three additional shop units as follows: blacksmith shop, foundry and pattern shop and the erecting shop. The machine shop is already in operation.

IT COSTS GOOD MONEY

Money that you do not need t· spend, to o·erate the engine that is supposed to be exhausting free to the atmosphere at all times under back pressure, because the piping is a little small for the quantity of steam that has to be passed through it, or because the closed heater in the exhaust line, with its limited area, creates the back pressure.

Now, you can pipe up a COCHRANE FEED-WATER HEATER AND PURIFIER in such a manner that it does not make any difference whether you are passing 100 or 500 H. P. of exhaust steam through the main, so that the heater itself, being arranged to draw its supply, will not be responsible for a particle of back pressure. For between the heater and engine you can run a free pipe straight to the atmosphere.

Then besides, these COCHRANE HEATERS will give you the highest attainable temperature—as good purification as can be obtained with exhaust steam—and a freedom from trouble and repairs that would constantly delight you.

More reason why these "COCHRANES" are entitled to your consideration will be found in our catalogue 11-H. This catalogue for the asking.

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A MATTER OF CHOICE

LOTS OF FUEL, LITTLE STEAM, MUCH WASTE, DIRTY BOILERS — OR — LITTLE FUEL, LOTS OF STEAM, NO WASTE AND CLEAN BOILERS

ITS UP TO YOU. THE LATTER IS ATTAINED BY THE USE OF STILWELL'S FEED WATER HEATER.

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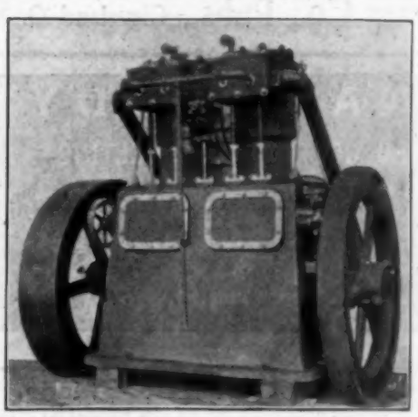

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makes the best and cheapest rail-fastening. NUTS NEVER WORK LOOSE. Requires no nut-lock. Our Elastic Self-Locking Steel Nut always stays, and is superior for use on Cars, Track, Bridges, Machinery etc. Write us for prices on Sq. and Hex. Nuts, (Elastic or Common) Machine Bolts, Track Bolts, Rivets, etc.
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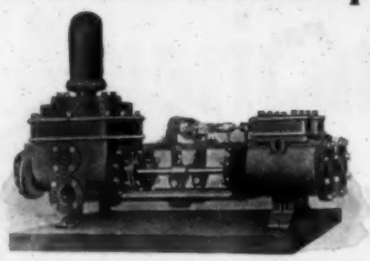
The Blakeslee Duplex Steam Pumps



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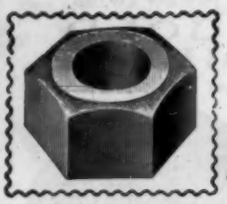

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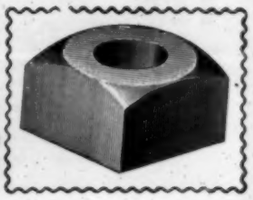

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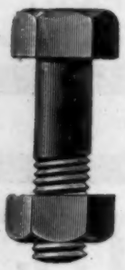

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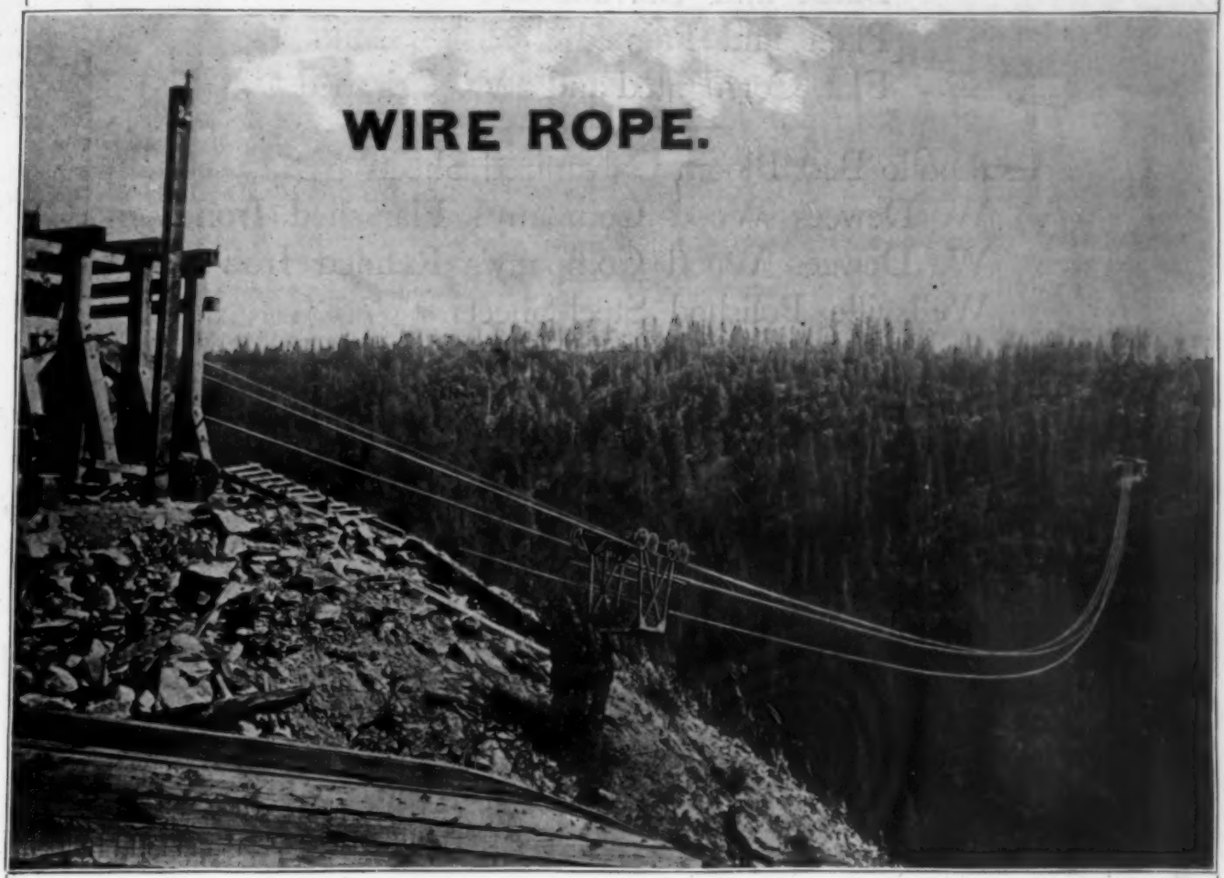

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